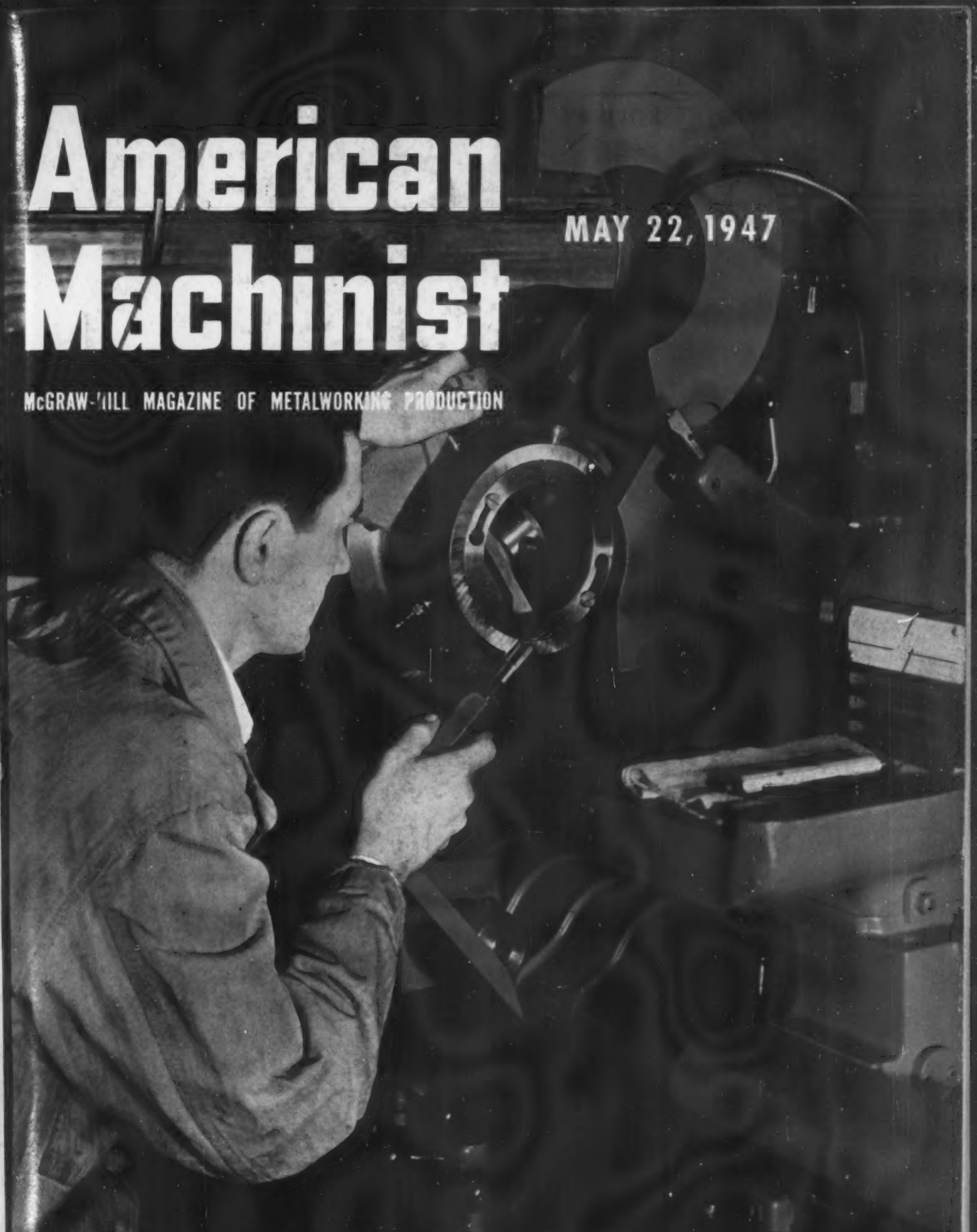
American Machinist

MAY 22, 1947

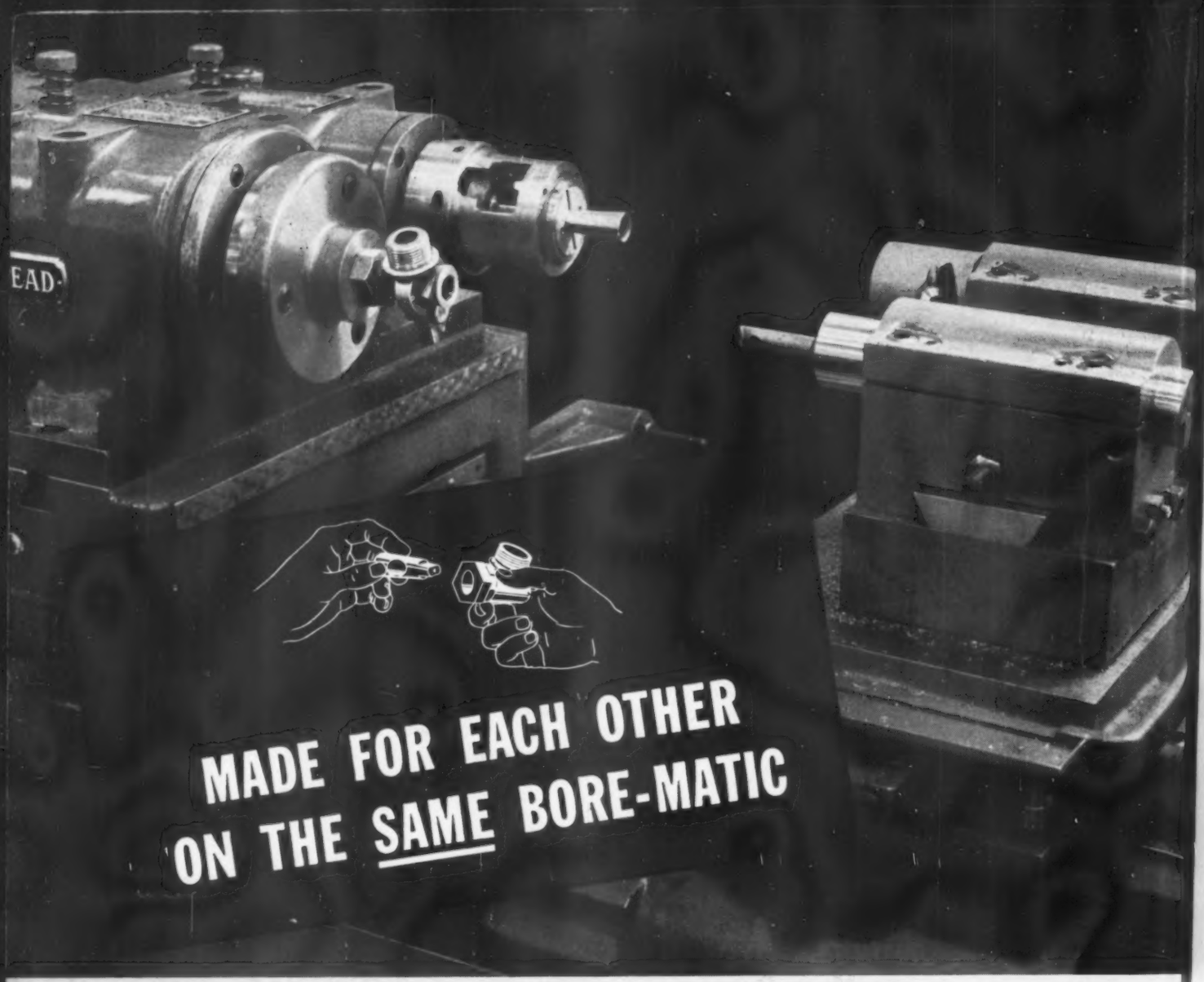
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



ULTRA-PRECISION INTERNAL GRINDING

APPRENTICE TRAINING — a special report

DIE DESIGN FOR ALUMINUM ALLOYS



Here's how Heald gives you automatic accuracy in precision-fitted parts... borized on the same machine, at the same time.

In any machining operation involving precision-fitted parts, you get faster, surer, more economical results when you borize *mating* parts on the *same* Heald Bore-Matic . . . at the *same* time. For borizing is a finishing operation in itself, in most cases eliminating need for extra lapping. Accuracy is automatic, without possibility of error — all like parts come out twins, and every pair of opposite parts fits together perfectly.

In machining valve bodies and plugs, for example, one manufacturer was troubled with irregular production and a great deal of extra finishing. Heald engineers tooled up the Bore-Matic shown above, to bore bodies and turn plugs *simultaneously*. Result: balanced production of parts . . . negligible rejects . . . lower tool costs with cemented carbide boring tools. And all valve parts are completely interchangeable, eliminating the re-machining and selective assembly previously required.

Cost savings like these are possible with every Precision Grinder or Bore-Matic in the Heald line. If you want closer control over your machining operations, with a higher rate of production at a lower cost per part, there is a Heald machine to do the job, and a staff of 200 Heald engineers to give you friendly, expert advice. For further information, write: THE HEALD MACHINE COMPANY, Worcester 6, Mass.

HEALD

means more precision
. . . less cost

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American Machinist

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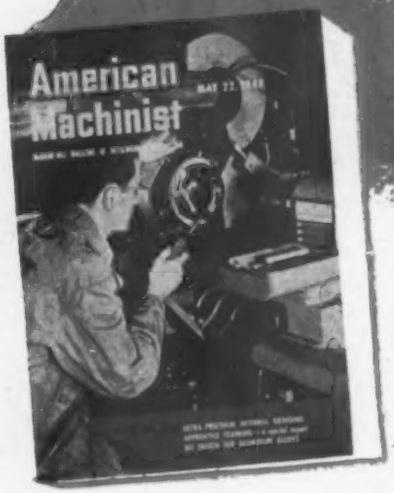


Chips and QUIPS

Ultra-precision Grinding . . . Stan Kozak, of Bryant Chucking Grinder, holds his breath while he checks with a Precisionaire gage, the last hole in a special part for General Electric. Nine annular holes must be finished to a tolerance of fifty millionths of an inch. The machine is a Bryant No. 112 with a hi-frequency wheelhead capable of speeds up to 100,000 rpm. Kodachromed by Alan Brown, this machine is of the type that achieves precision to five millionths and surfaces to half a millionth by the technique described in our lead article.

Apprentices . . . Our current special report, ninth of the year, is a roundup on the latest and best in apprentice-training practice by Harry Williams, associate editor. It draws attention to a current problem—neglect of apprenticeship during the depression and war. Government officials of the Apprentice Training Service call it best yet on the subject, ordered 10,000 copies . . . Another facet of the question—potential need for toolmakers—is the subject of our Round Table discussion.

Old-Timer . . . Charles A. Trask, who has read *American Machinist* since about 1880, dropped us a line the other day. He started as an apprentice for 10 cents an hour, got to 15 cents after four months, then decided he wanted to learn faster so subscribed to *A.M.* Says he: "The outstanding contributor was Prof. John E. Sweet; he and the *American Machinist* were responsible for my ability to operate a machine shop at the age of 22."

Tricky Tooling . . . Rack-and-gear drive for tapping with straight-line power (press, air cylinder) is explained by Ed Anderson of Lee Tool Company . . . Two other articles likewise show tricky tooling, one being the description of new transfer-press installations at AC Spark Plug and the other the picture story of a press and welder group knocking out 1800 washing-machine bases a day for 1900 Corp. Both were written by master mechanics, Hubert Curtis for AC Spark Plug and Kenneth Brooks for 1900. Both, as a consequence, are packed with production ideas for plants large and small.

Tomorrow's Production . . . In September, the National Machine Tool Builders Assn. will stage the first Machine Tool Show in 12 busy years—a show that will undoubtedly bring out more productive machining methods than have ever been assembled before. To give you perspective for the show, *American Machinist* begins in this new issue a series of special articles on machine-tool developments. They will help you get maximum return from your show visit, or provide some idea of trends if you can't make it.

Mechanical Backs . . . Autocar, to complement its standard materials-handling system, has developed a number of handling aids, ever mindful of that old rule, "If you don't have to handle it, DON'T." Associate Editor Wharen, who apprenticed there, describes them.

Die Fundamentals . . . E. W. Mason (see biog.) of the Development Div., Alcoa, gets down to practical consideration of fundamentals in designing dies for everything from beer barrels through kettles to canoes . . . More practical "dope" is included in Robert Spence's discussion of the cost system and foremen, and on plastic ways.

Coming . . . *American Machinist* for June 5 will detail a working machine-tool replacement policy that resulted in $750,000 worth of machine tools in 1946, show milling setups on electric razors. There'll be pointers on maintenance of welders, a report on a study of bearing surface finish at Gisholt . . . Eugene Goddess will describe a quality-control chart . . . Our special report will be tricky Metalworking applications of functional photography.

DIE ENGINEER . . . E. W. Mason, of the Home Appliance Section, Development Division, New Kensington Branch, Aluminum Company of America, is working on design and fabrication problems in applying aluminum to home appliances and materials-handling equipment. Author of an article in this issue ("Die Design for Aluminum Alloys"), he has been with Alcoa for the past seven years. He joined the company in the M.E. Dept., Pittsburgh, then spent four years as staff engineer at the Spokane, Wash., plant producing aluminum sheet for aircraft. He's been on his present job about a year.

His BSME degree is from the University of Pittsburgh (1933). From that date until 1940 he was with Mesta Machine Co., Pittsburgh.

EASIER HANDLING

New Gleason No. 26 Quenching Press

. . . a larger machine to handle larger gears, discs, liners, bearing races, etc.

A larger machine incorporating all of the features which made the Gleason No. 16 Quenching Press so widely accepted . . . positive control of work . . . entirely automatic, metallurgically correct oil flow . . . simplified changing of work and dies . . . built-in pumping system and oil reservoir capacity up to 25" in diameter.

QUICK SETUPS

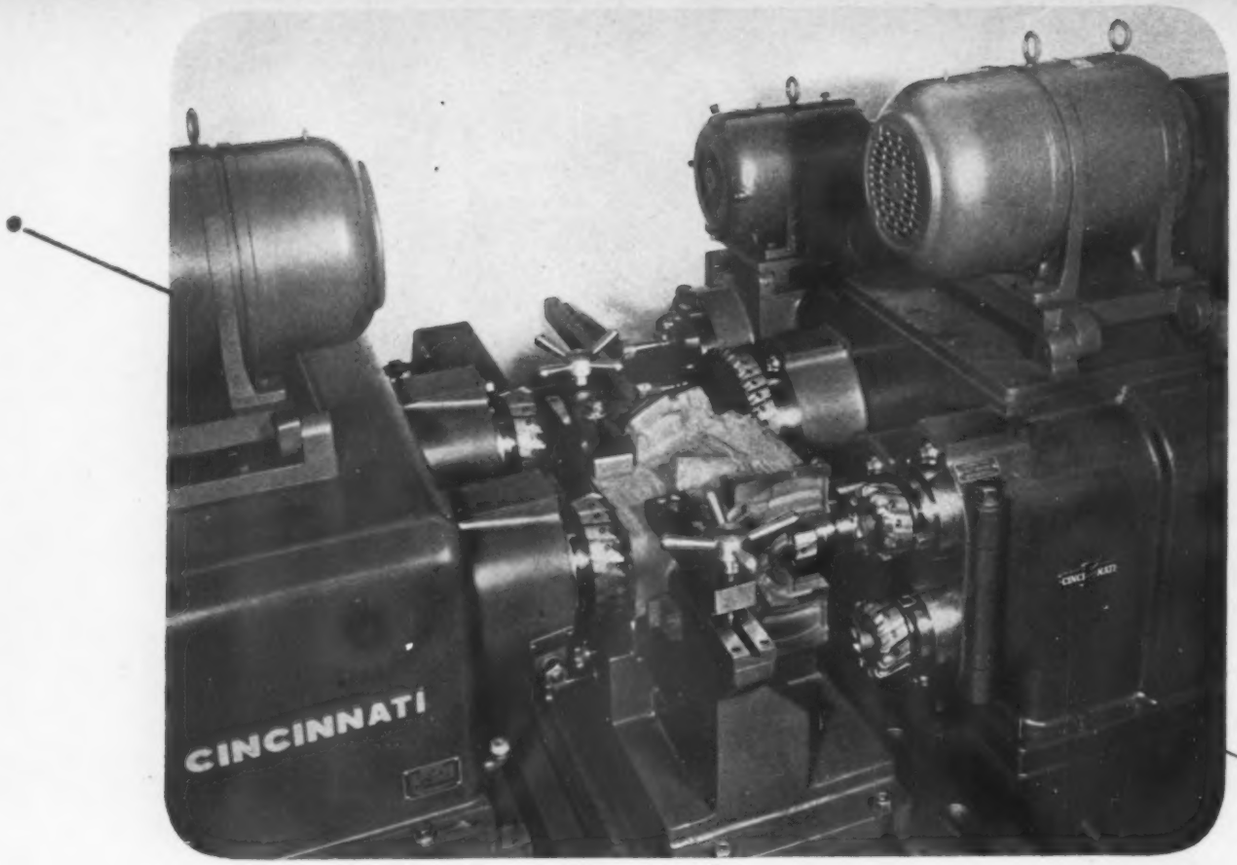
SIMPLIFIED CHANGING OF WORK AND DIES

QUENCHING OF HEATED PARTS WITHOUT DISTORTION

Write for descriptive literature . . . send in prints of parts you wish to quench . . . let us show you how this new press will solve your problems.

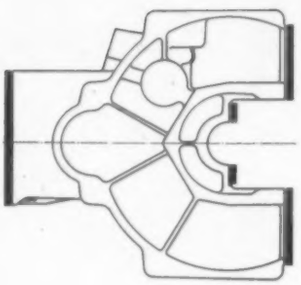
GLEASON *Works*
1000 University Avenue
Rochester 3, N.Y., U.S.A.

Builders of Bevel Gear Machinery for Over Eighty Years



Close-up front view of the spindle heads and fixture, during the cutting cycle of a CINCINNATI No. 56-72 Duplex Hydromatic Milling Machine, with special right- and left-hand headstocks.

MULTIPLE SPINDLE mills several surfaces, in one



Drawing of cylinder block milled on the equipment illustrated here. Heavy lines indicate milled surfaces. Production averages 8½ per hour.

CINCINNATI

THE CINCINNATI MILLING

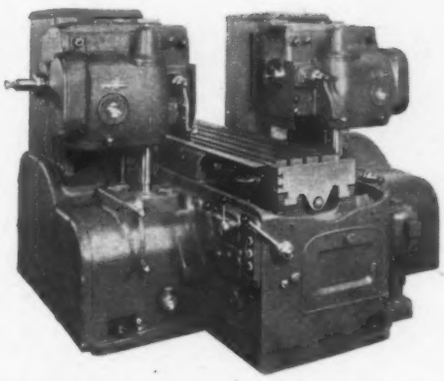
MILLING MACHINES

Two well-known ways to reduce manufacturing costs . . . by eliminating handling, and by combining operations . . . have been incorporated in the equipment illustrated here The machine is a CINCINNATI No. 56-72 Duplex Hydromatic Miller, with special multiple spindle headstocks, tooled up by Cincinnati Application Engineers to rough and finish mill the top, pan rail, and bearing seats of farm tractor cylinder blocks. There are eight spindles and eight cutters; six are sintered carbide, while the two small ones at the rear are high speed steel. The cutters toward the front (one on the left and three on the right—large illustration) rough mill all the surfaces, and then as the table continues its traverse, the cutters at the rear (illustrated below) take a finishing cut.

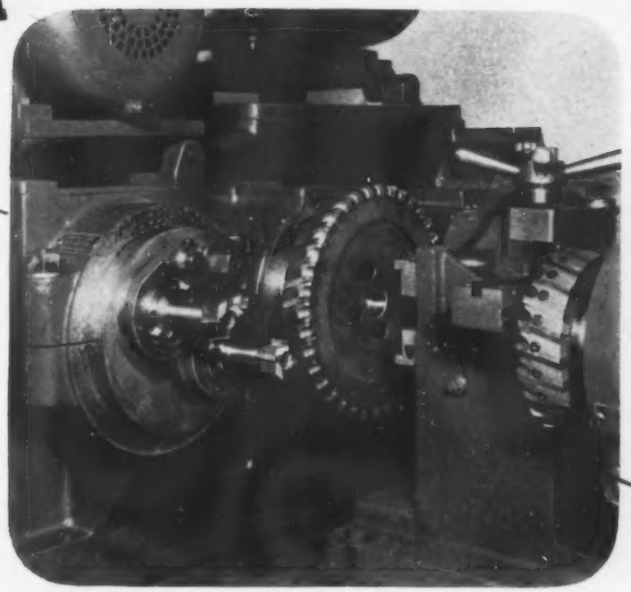
Through the CINCINNATI Hydromatic method of automatic variable feed control, the table traverses at 12 inches per minute for the rough cut, and 18 inches per minute for the finish cut. Production averages about 8½ cylinder blocks per hour.

This equipment, a Cincinnati design for lower cost milling operations, eliminates excessive handling of the work; combines operations; offers special machine performance on equipment built around standard units. ¶The facilities of Cincinnati Milling's extensive Research Department, and their 63 years of milling know-how, are available to you for reducing milling costs in your shop. It will pay you to present your milling problems to them.

HYDROMATIC rough and finish pass



CINCINNATI Duplex Hydromatics are available in 12 sizes. No. 4-48 illustrated. Catalog M-1372-1 contains complete specifications and other important details.



Close-up of the rear view, showing the arrangement of finishing cutters.

MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES

10 Every

Fellows 3" Fine-Pitch Gear Shaper with magazine feed for the automatic generating of small fine-pitch pinions.

• **HAVE YOU SEEN** the latest in gear science... the Fellows sound motion picture in natural color..."Highlights of the Art of Generating and Gear Manufacturing Equipment." Contact Springfield, Vermont, or our local offices for booking appointments.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

Minute!

with Generated Involute Teeth

Automatic Magazine Feed and Ejection on the Fellows 3" Fine-Pitch Gear Shaper produces high-accuracy Involute-Tooth Pinions...600 per hour!

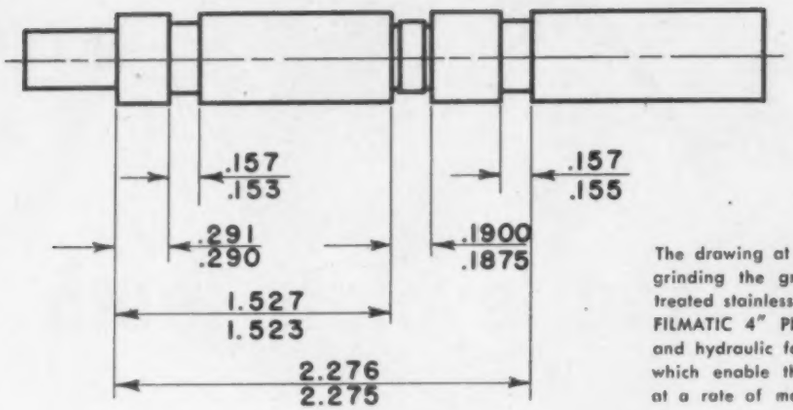
Small fine-pitch instrument gears...as fine as 64, 80 or even 200 pitch...are contributing to the quiet, smooth operation of many precision devices, as electric clocks, meters, microscopes, and motion picture cameras.

Involute accuracy at extremely high cutter speeds, coupled with magazine feed afford precision duplication of this 113 pitch pinion ...at the amazing production rate of ten every 60 seconds!

For the mass production of small fine-pitch gears, pinions, and precision instrument parts, the Fellows Fine-Pitch Gear Shaper is in a class by itself. Descriptive literature awaits your request. The Fellows Gear Shaper Company, Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2...or 640 West Town Office Bldg., Chicago 12.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR



The drawing at the left shows the tolerances for grinding the grooves, from the solid, in heat-treated stainless steel plungers, on a CINCINNATI FILMATIC 4" Plain Hydraulic. Automatic infeed and hydraulic footstock are time-saving features which enable the operator to grind these parts at a rate of more than one a minute.

. . . WITH THIS

AUTOMATIC INFEED on CINCINNATI FILMATIC 4" Plain Hydraulic Grinder. Stroke for the automatic infeed cycle adjustable for stock allowance up to .060" and retraction up to 1".

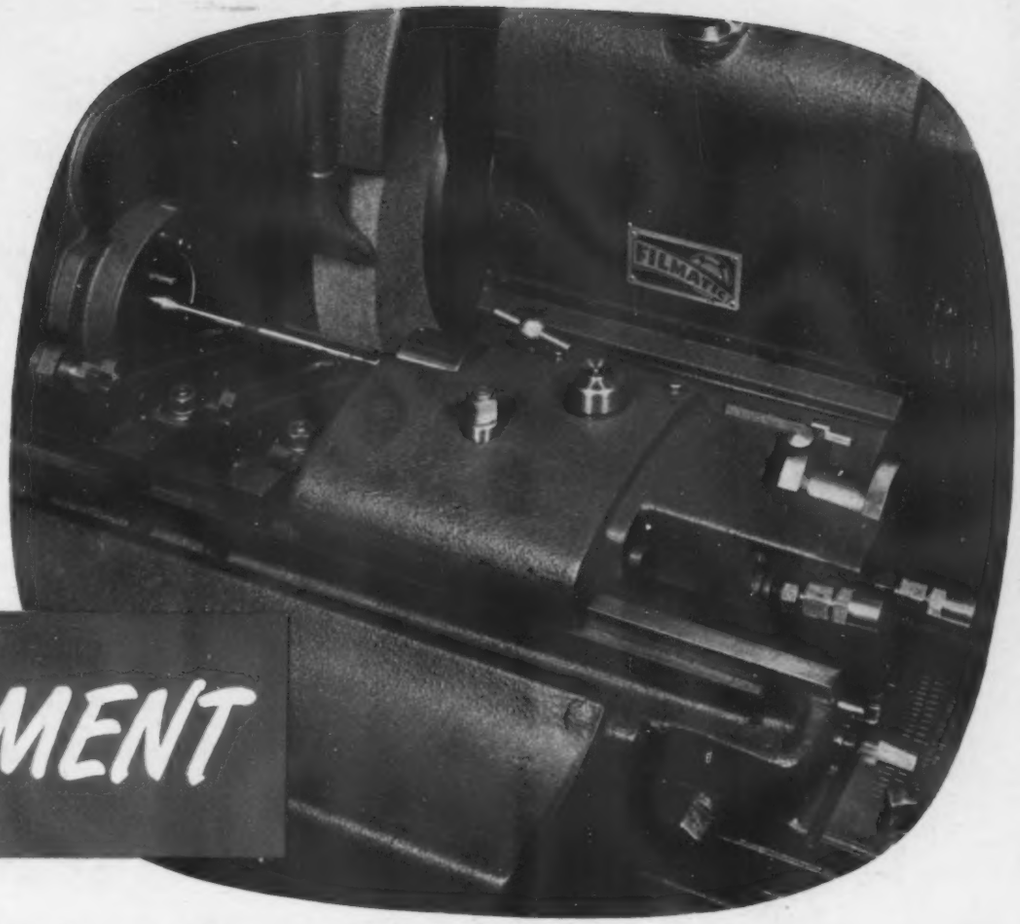
Precision center-type

CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machines are available in 4"x 12", and 4"x 18" sizes. Catalog G-551 contains complete specifications and design highlights.

CINCINNATI

CINCINNATI GRINDERS

CENTER TYPE GRINDING MACHINES



Close-up showing the hydraulic footstock on a CINCINNATI FILMATIC 4" Plain Hydraulic Grinding Machine. In this illustration, armature shafts are automatically infeed ground at a production rate of 200 per hour per diameter.

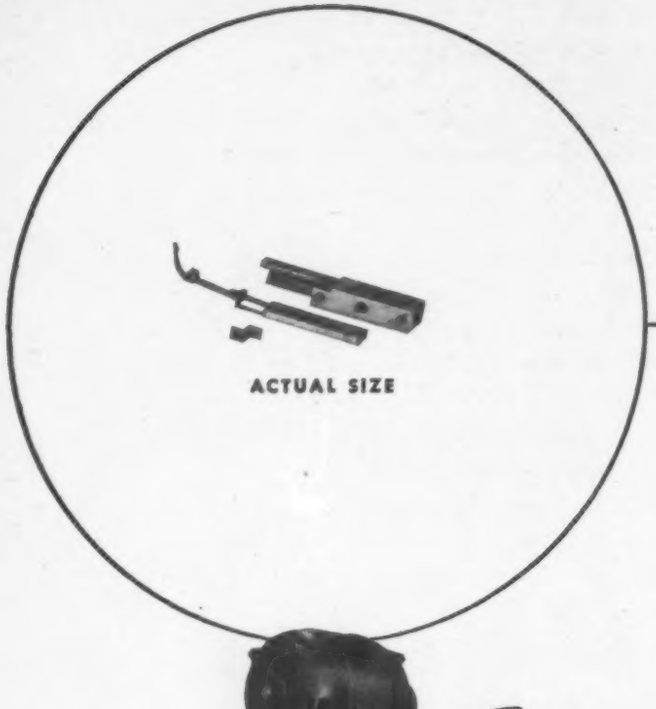
EQUIPMENT

grinding is largely automatic . . .

● Precision infeed grinding operations on small center-type work can be handled easily, speedily and economically on CINCINNATI FILMATIC 4" Plain Hydraulic Grinders equipped for work of this type. The equipment consists of (a) Automatic Infeed Unit, illustrated on the opposite page, and (b) Hydraulic Footstock, shown above. They take over much of the operator's manual effort through a grinding cycle which is automatic and very rapid, initiated by moving a single lever to the "IN" position. The centers engage the work; the work rotates; coolant starts; the wheel rapidly advances, grinds to size and finish, then rapidly retracts; coolant flow shuts off, work stops rotating, and footstock center withdraws. During the grinding cycle, the operator dogs the next work piece. What could be easier and more productive for center-type production grinding operations on small parts? ¶ The CINCINNATI FILMATIC 4" Plain Hydraulic offers many other advantages, too, including FILMATIC grinding wheel spindle bearings. For more information, write for catalog G-551.

INCORPORATED CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES



ACTUAL SIZE

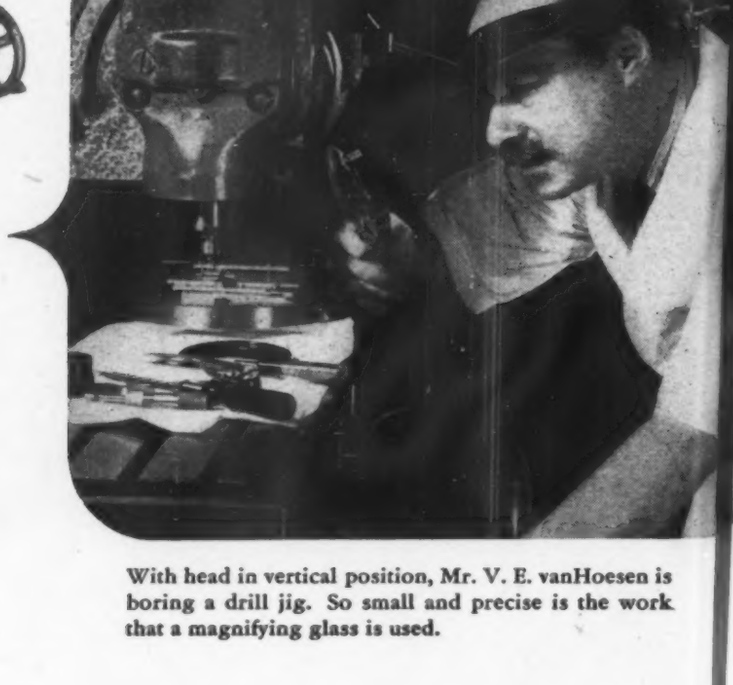
MILL SPRING

TO .0028"

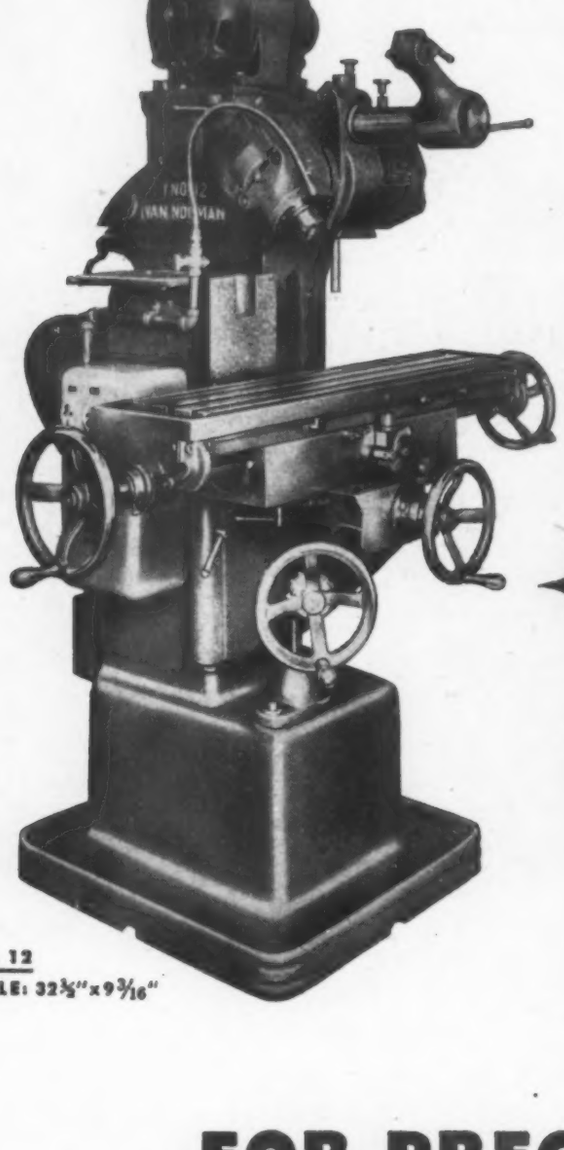
THICKNESS

± .0001"

This Precision Work



With head in vertical position, Mr. V. E. vanHoesen is boring a drill jig. So small and precise is the work that a magnifying glass is used.



NO. 12
TABLE: 32½" x 9 3/16"

FOR PRECISION MILLING

Work so fine and precise that a magnifying glass must be used to perform the milling operations . . . that's typical of accurate work that is done on Van Norman Ram Type Milling Machines. Illustrations below show some of the milling operations performed in making a marine chronometer detent.

Note the facts as stated by Mr. V. E. vanHoesen, watchmaker, A. Graves & Steuwer Company, Memphis, Tenn., who performed the work.

"Inertia and force of the detent spring must be reduced to the very lowest point consistent with its functions, therefore, it is necessary that this spring be extremely thin.

"We milled this spring to a thickness of .0028 inches and were successful . . . in having less than five percent spoilage in this operation and tolerance was easily held within plus or minus .0001 inches.

"On the part made of nickel, width of the shallow lengthwise slot had to be maintained within plus or minus .0001 inches and absolute parallelism was necessary with the face containing the dowel pins.

"As to the small S shaped piece, the fact that this angle bracket fitted into the assembly without dowel pins shows the type of tolerances which had to be maintained here.

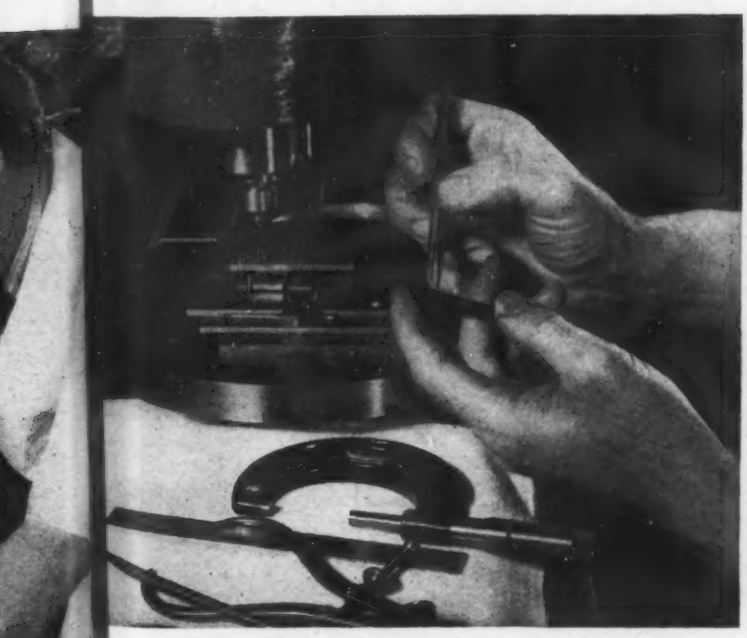
"All drill jigs and milling fixtures for the job were jig-bored on the machine."

In addition to accurate performance, Van Norman Ram Type Millers increase production and cut milling costs. Write for information.

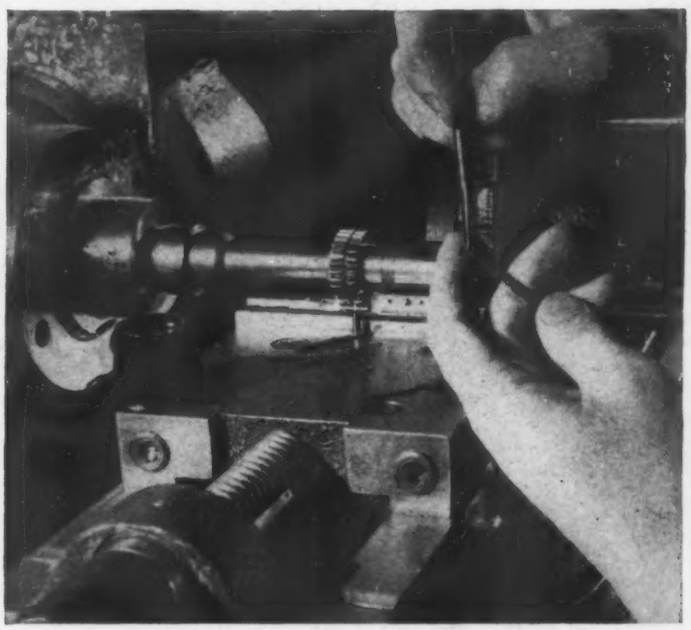
VAN NORMAN COMPANY

SPRINGFIELD 7, MASS.

rk Performed on the Van Norman No. 12



Checking the finished drill jig for accuracy. This is the largest of five jigs used in making the detents.

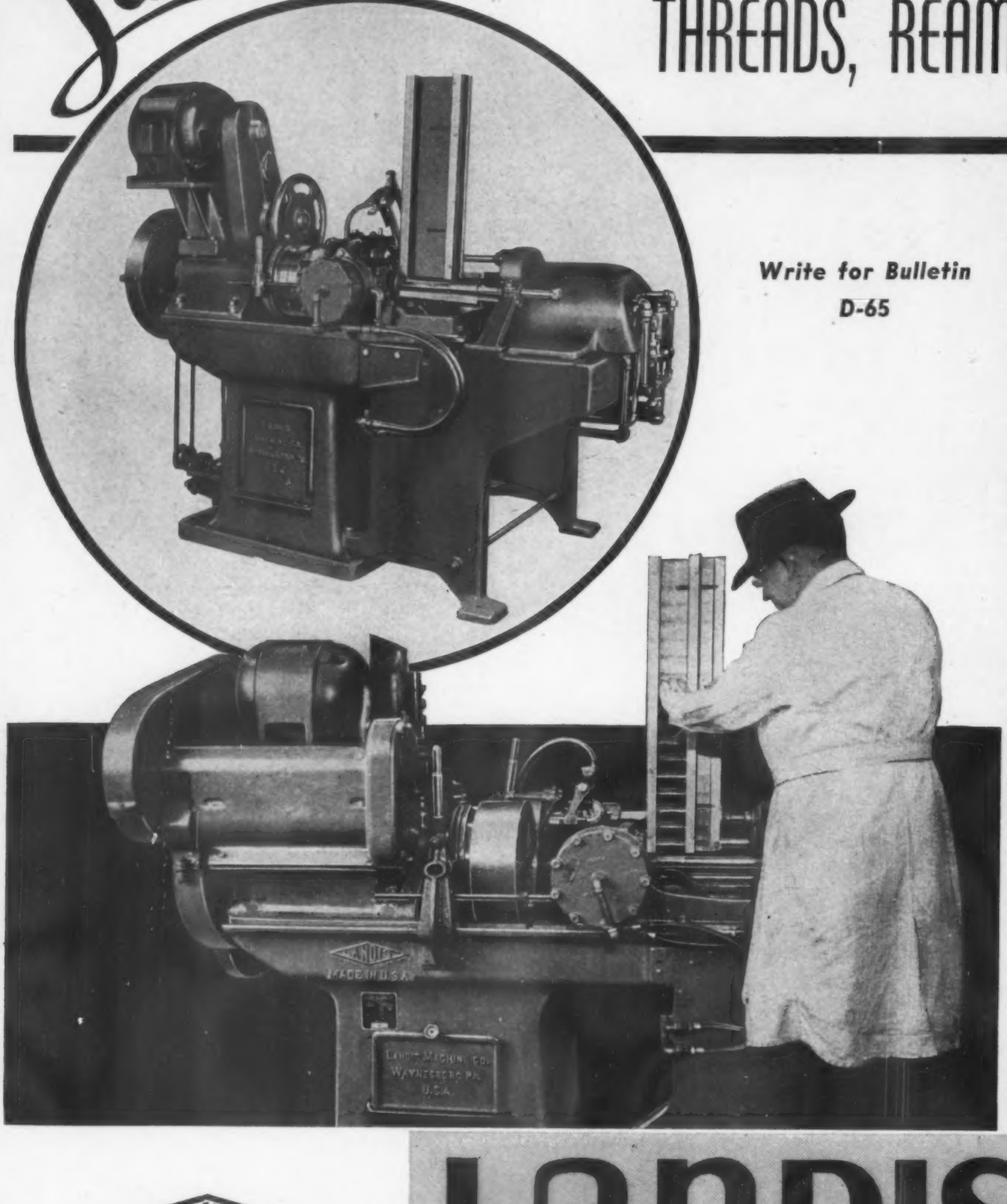


Operator checks the work piece after taking the horizontal gang milling cut.

. . . "It Pays to Van Normanize"

Landis AUTOMATIC

THREADS, REAMS



Write for Bulletin D-65

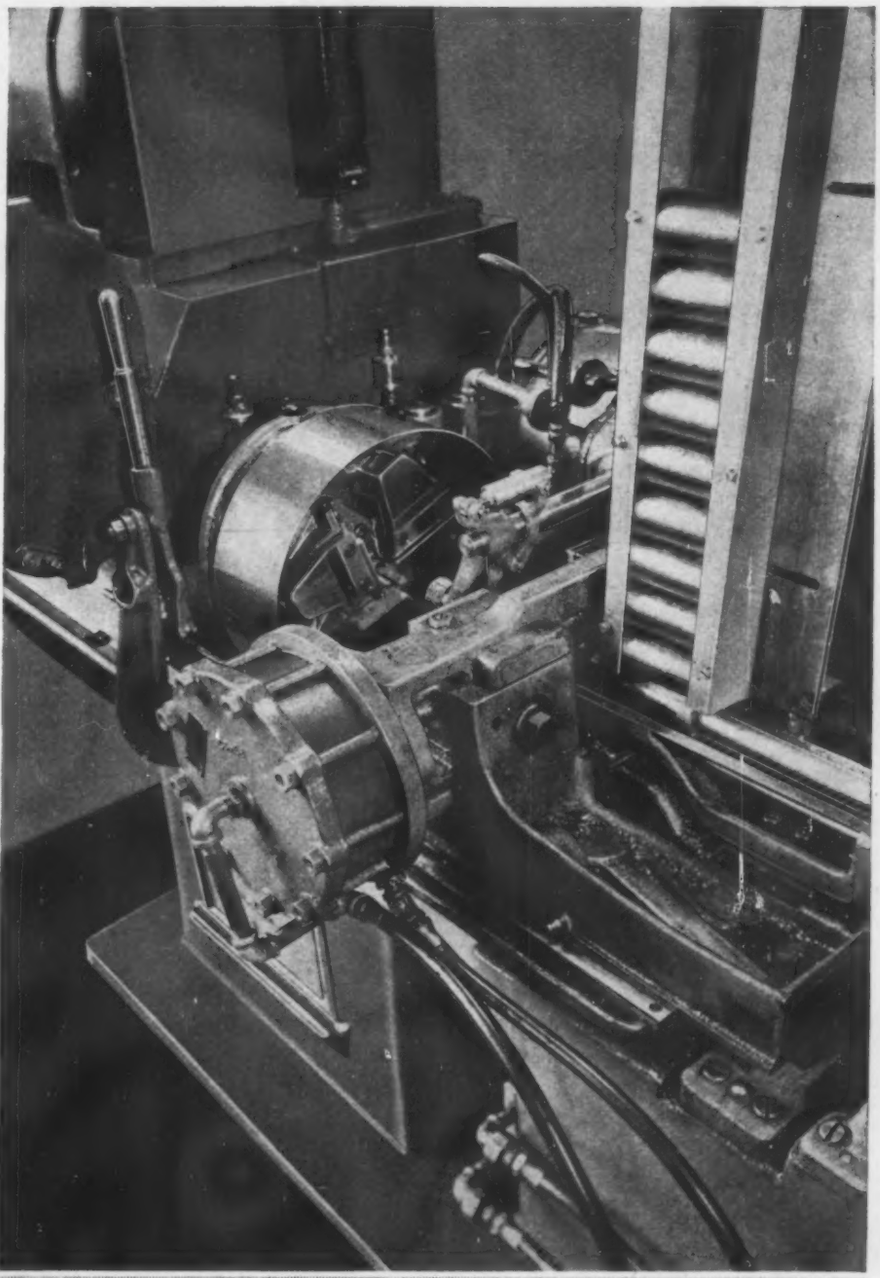
LANDIS

LANDIS
REG. U.S. TRADE ~ MARK PAT. OFF.

NIPPLE MACHINE

& CHAMFERS BOTH ENDS OF SPACE NIPPLES

Automatically!



● The Landis Automatic Nipple Machine is illustrated producing 1½" diameter 5" long nipples at the rate of 235 an hour in the plant of a well-known nipple manufacturer. Nipples can be produced by this machine at rates ranging from 183 to 600 per hour, depending on the diameter of the nipples.

These machines have two spindles, each equipped with Lanco Internal Trip Semi-Receding Pipe and Nipple Die Heads and Reaming Attachments. The two carriages have air-operated vises for gripping the nipples and the left-hand carriage carries an adjustable magazine from which the nipple blanks are fed automatically into the machine.

The machines are driven by a constant speed motor, with change gears provided to give the required speeds for the pipe size to be threaded. A safety clutch is built into the drive to prevent serious damage if a jam occurs. The drive and cam mechanisms are enclosed, and convenient lubrication devices are provided for all bearings.

Landis AUTOMATIC NIPPLE MACHINES are built in two sizes: the 1¼" size for producing ½" and ¾" nipples, 2" to 6" long; and the 2" size for producing 1" nipples 2½" to 6" long, 1¼" nipples 3" to 6" long, or 1½" and 2" nipples 3" to 6" long.

MACHINE CO. WAYNESBORO PENNA. U.S.A.

Reduce Precision Grinding Costs BY FITTING

UNIVERSAL GRINDERS

12" x 28" UNIVERSAL AND TOOL GRINDER—For precision tool room grinding and miscellaneous small grinding jobs. Grindingoperations on standard machines: cylindrical, taper, face, surface, clearance on saws, flutes on taps, face of teeth on formed cutters, spiral mills. Usefulness extended by 22 optional accessories. Catalog K45.

12" LCH HYDRAULIC UNIVERSAL GRINDER—For tool room and production grinding—straight cylindrical, shoulder, taper, face and internal. Maximum work diameter 12"; available in four sizes for work lengths of 30", 36", 40" and 48". Catalog I44.

PLAIN GRINDERS

10"—14" TYPE CH PLAIN HYDRAULIC GRINDER—For straight cylindrical, shoulder, taper and profile grinding of volume production of parts such as: motor armatures, shafts, spindles, crankshaft line bearings, steering knuckles, etc. Maximum work diameters 10" and 14". Available for each in lengths between centers of 18", 36", 48", 72", 96", 120". Catalog B43.

4" TYPE H PLAIN HYDRAULIC GRINDER—For straight cylindrical, shoulder, taper or profile grinding of small light parts not exceeding 1½" diameter. Maximum diameter 4"; available in 12" and 18" lengths between work centers. Catalog A44.

SPECIAL MACHINES FOR SPECIAL JOBS

- Crankshaft Grinding
- Crankshaft Regrinding
- Camshaft Grinding
- Valve Grinding
- Ball Race Grinding
- Roll Grinding

OPTIONAL ADDITIONAL FEATURES and TOOLING FOR HIGH PRODUCTION

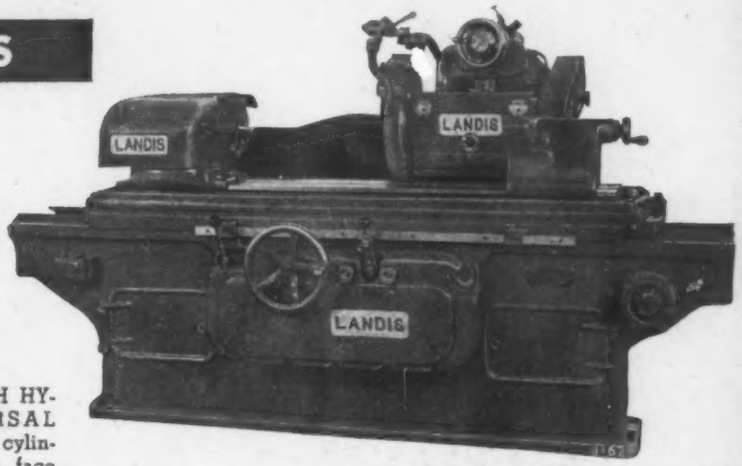
- Automatic Sizing
- Crowning Mechanism
- Hydraulic Footstock
- Hydraulic Rapid Infeed
- Oscillating Headstock
- Reciprocating Wheelbase
- Visual Sizing
- Wheel Dressing Fixtures
- Work Ejectors
- Work Holding Fixtures

LANDIS TOOL COMPANY • WAYNESBORO, PA.

THE MACHINE TO THE JOB

UNIVERSAL GRINDERS

10" x 20" TYPE H HYDRAULIC UNIVERSAL GRINDER—For straight cylindrical, shoulder, taper, face and internal grinding. Ideal for fast production of small tools and precision small parts which require universal features such as face or internal grinding. Catalog I-145.



12" — 14" — 16" — 18" TYPE C HYDRAULIC UNIVERSAL GRINDERS—For straight cylindrical, shoulder, taper, face and internal. For tool room grinding of quantities of gauges, mandrels and boring bars; for production grinding and very fine finishes. Available in three maximum work lengths—36", 48" and 72" for maximum work diameters of 12", 14", 16" and 18". Catalog J242.

CENTERLESS GRINDERS

CENTERLESS THREAD GRINDER—For through feed grinding of threads to high precision in a single pass with a formed wheel.

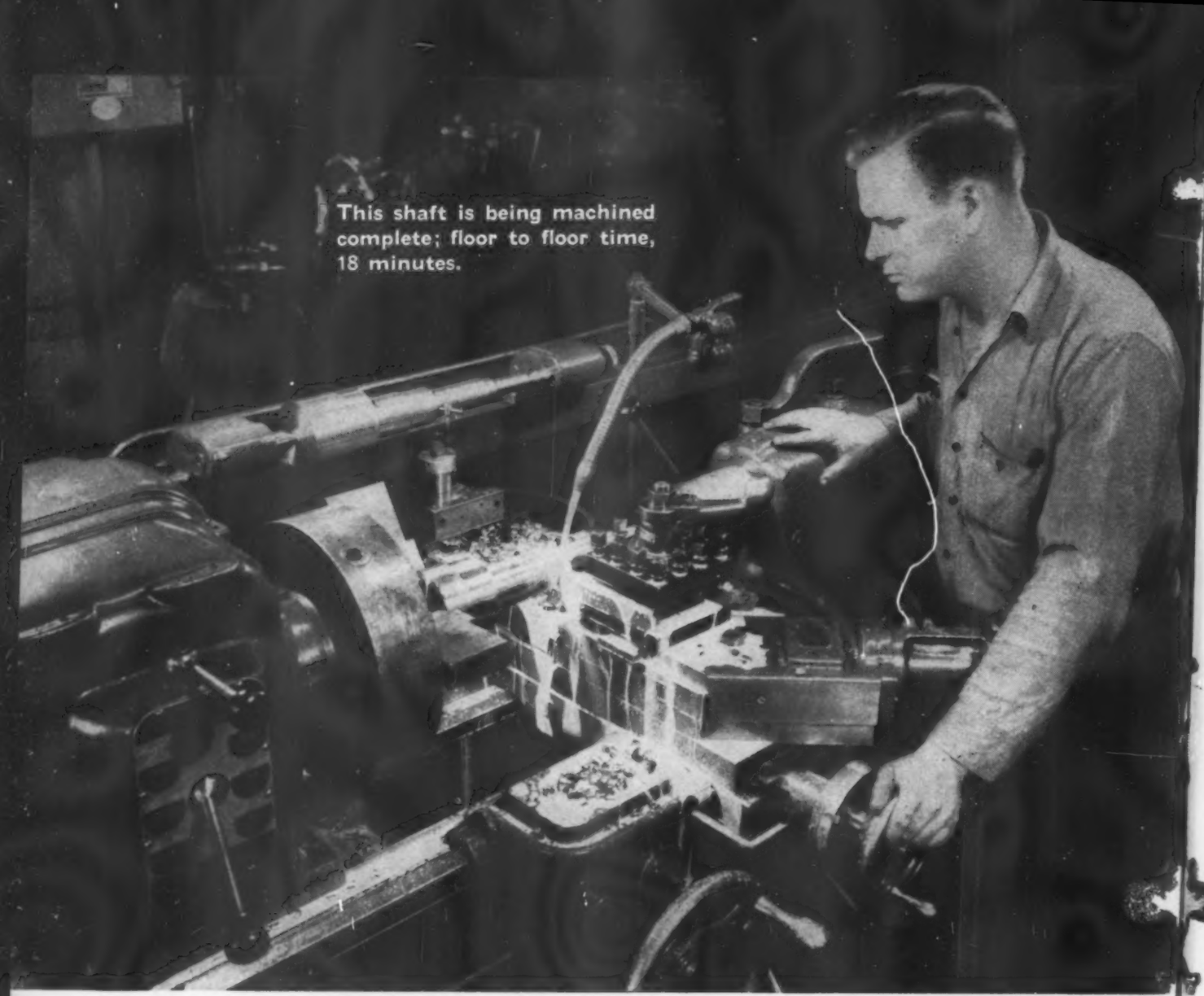
NO. 12 CENTERLESS GRINDING MACHINE—For through feed straight cylindrical grinding, taper grinding and infeed grinding up to a shoulder. Work diameters 1/16" to 3 1/2". Catalog T44.

OVER 150 DIFFERENT TYPES OF LANDIS TOOL PRECISION GRINDERS

all available with the exclusive *microsphere wheel spindle bearing* for fine finish and close tolerances and LANDIS TOOL engineered grinding service to help you get the best solution.

EQUIPPED WITH MICROSPHERE BEARINGS

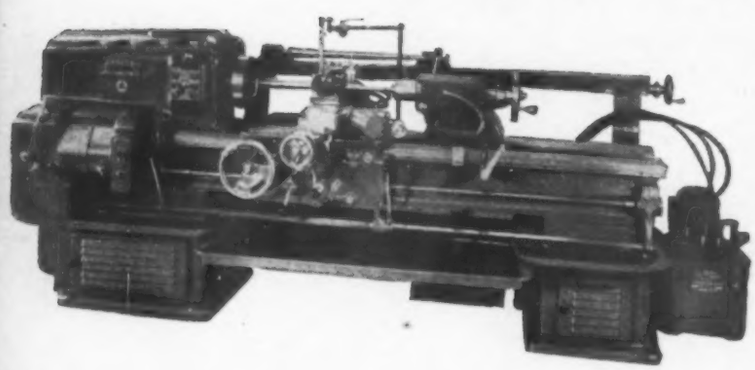
LANDIS TOOL *Precision Grinders*



This shaft is being machined complete; floor to floor time, 18 minutes.

SHAFT PRODUCTION COSTS

CUT TO THE BONE...



The new "American" "H S-D" (Hydraulic Shaft-Duplicating) Lathe presents to the metal-working industry a new and revolutionary technique for the production of various types of shafts. Other methods are now outmoded by this new development. Production costs have hit a new low. Piston rods that formerly took over 4 hours are now produced on this lathe in 36 minutes.

• Write for descriptive literature—Bulletin No. 35

THE AMERICAN TOOL WORKS CO.

Cincinnati, Ohio, U. S. A.

Lathes and Radial Drills

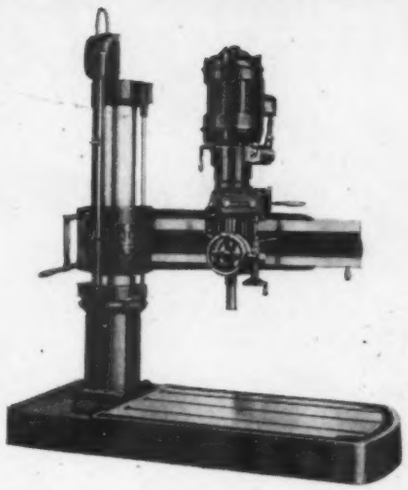
Amer

FOR SPEED, POWER, AND ACCURACY

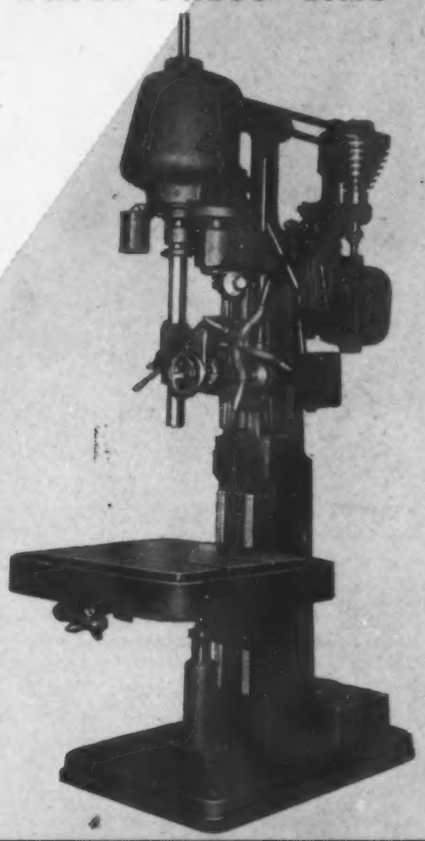
IT'S C-O... from the word "GO!"

WORLD'S MOST COMPLETE DRILL PRESS LINE

8 — 12 SPEED MOTOR SPINDLE RADIAL DRILL



1-¾" capacity with 3 ft., 4 ft., and 5 ft. arm. Simply designed, easy to operate, for close precision work. Powered by 2 h.p. constant horsepower motor, magnetically controlled, 1200 RPM and 1800 RPM. 4 rates of power feed. Automatic trip. Ideal for tapping.



21" BOX COLUMN SLIDING HEAD FLOOR DRILL

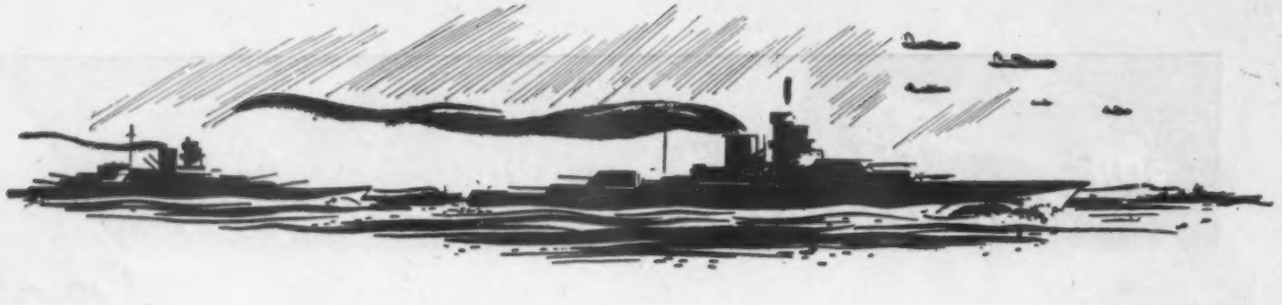
1-½" capacity, available in 1-, 2-, 3-, 4- & 6-spindle models, of full ball and Timkenroller bearing design. Eight step Vee belt drive on famous C-O tilting motor bracket gives sixteen spindle speeds. Positive geared power feed. Automatic stop. Also operates through lever power feed, or worm wheel feed. Accurately machined column, base and adjustable table.

C THE WORLD OVER O

CANEDY-OTTO MFG. COMPANY

CHICAGO HEIGHTS, ILLINOIS

Builders of the World's Most Complete Drill Press Line — radial drills, sensitive drills, upright drills, hi-speed drills and special drilling machinery.



Here's a "Task Force" that makes Milling Jobs *Move!*

Specify Morse Hi-Helix End Mills for your milling jobs and costs go down thru faster cutting, longer service life and tough-job dependability.

Morse Hi-Helix End Mills have an *edge* over ordinary mills because more than 80 years of cutting tool "savvy" combines with 18-4-1 *High Speed Steel* and *special heat treatment* for toughness without sacrificing cutting ability. Benefits are quickly noticeable in a cutting action smooth, rapid and with a minimum of chatter—plus shear cutting performance that causes the chips to curl and roll out without clogging the flutes.

Remember, too, that Morse Hi-Helix End Mills are properly undercut and ground with a *primary* and *secondary clearance* for use in the general run of materials. "Morse" means more quality in machining—and a full line. Your Industrial Supply Distributor can provide a Morse recommendation in selecting the precise end mill for *your* job.

Accuracy, Quality, Uniformity: the MORSE Code of Cutting-Tool Manufacture

MORSE TWIST DRILL & MACHINE COMPANY

The Original Manufacturer of Twist Drills

NEW BEDFORD, MASSACHUSETTS

New York Store: 130 Lafayette St. • Detroit Store: 2952 East Grand Blvd. • Chicago Store: 570 West Randolph St. • San Francisco Store: 1180 F

No. 1895 Hi-Helix Double End Mill. Four flutes. For general end milling.

No. 1887 Hi-Helix Ball End Mill. Two flutes. For milling fillets, round bottom holes, radius-bottom slots, etc.

No. 1896 Hi-Helix Double End Mill. Two flutes. Ideal for milling keyways, slots, channels, etc.

No. 1898 Hi-Helix Single End Mill. Two flutes. For milling keyways and slots from the solid, can be fed directly into work without previous drilling operation.

No. 1900 Hi-Helix Long Single End Mill. For milling out slots, recesses, etc., that cannot be reached by regular length mills.

No. 1895 Small Diameter Hi-Helix Double End Mill. Four flutes.

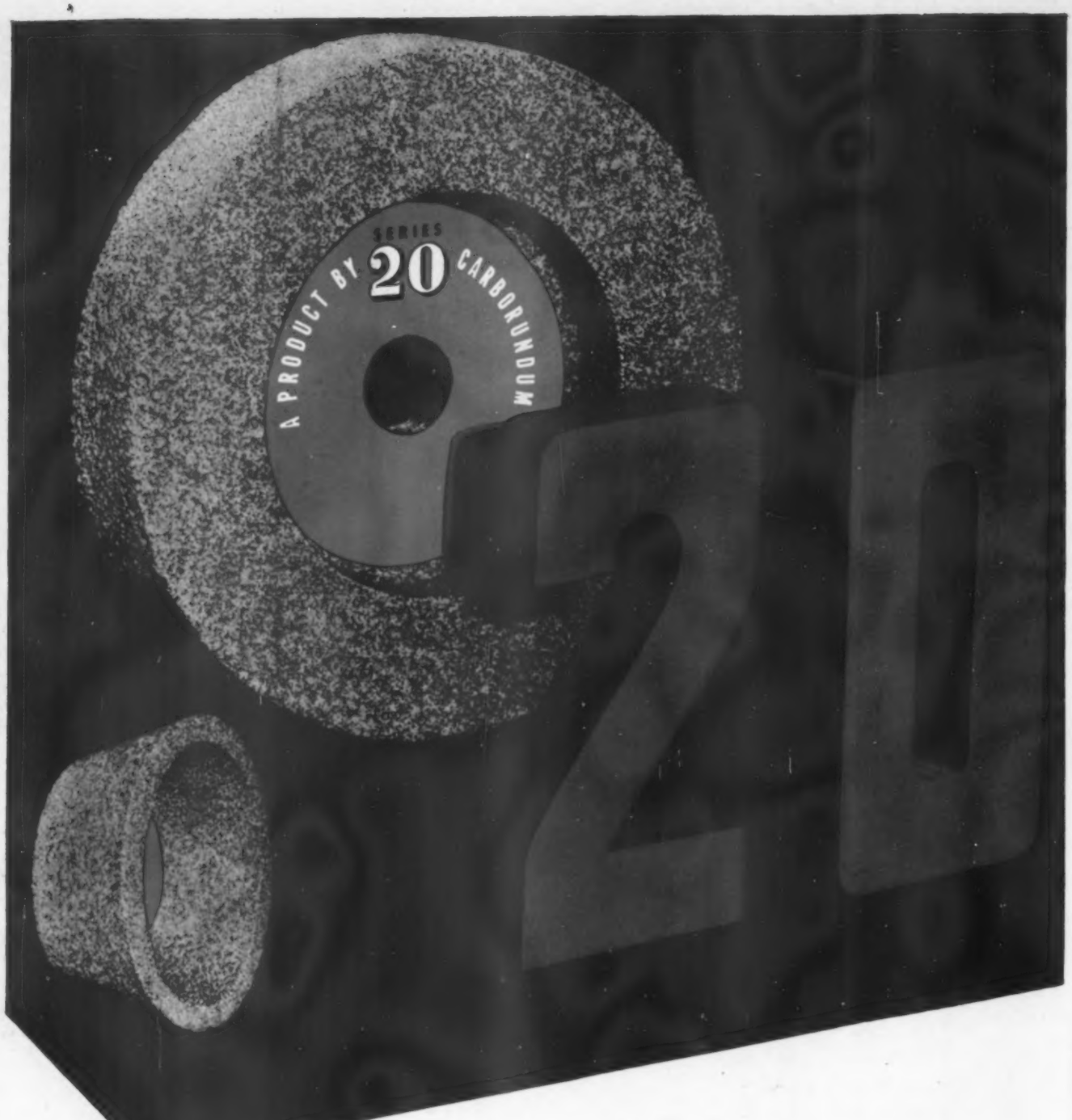
No. 1896 Small Diameter Hi-Helix Double End Mill. Two flutes.

No. 1903 Hi-Helix Long Single End Mill. Right hand cut—left hand spiral. The tool for deep slots where regular length mills will not reach.

No. 1897 Hi-Helix Single End Mill. For general end milling.

No. 1902 Hi-Helix Single End Mill. Right hand cut—left hand spiral. Used in die work, etc.

No. 1899 Hi-Helix Long Single End Mill. Two flutes. For deep milling of slots which cannot be reached with ordinary length mill.



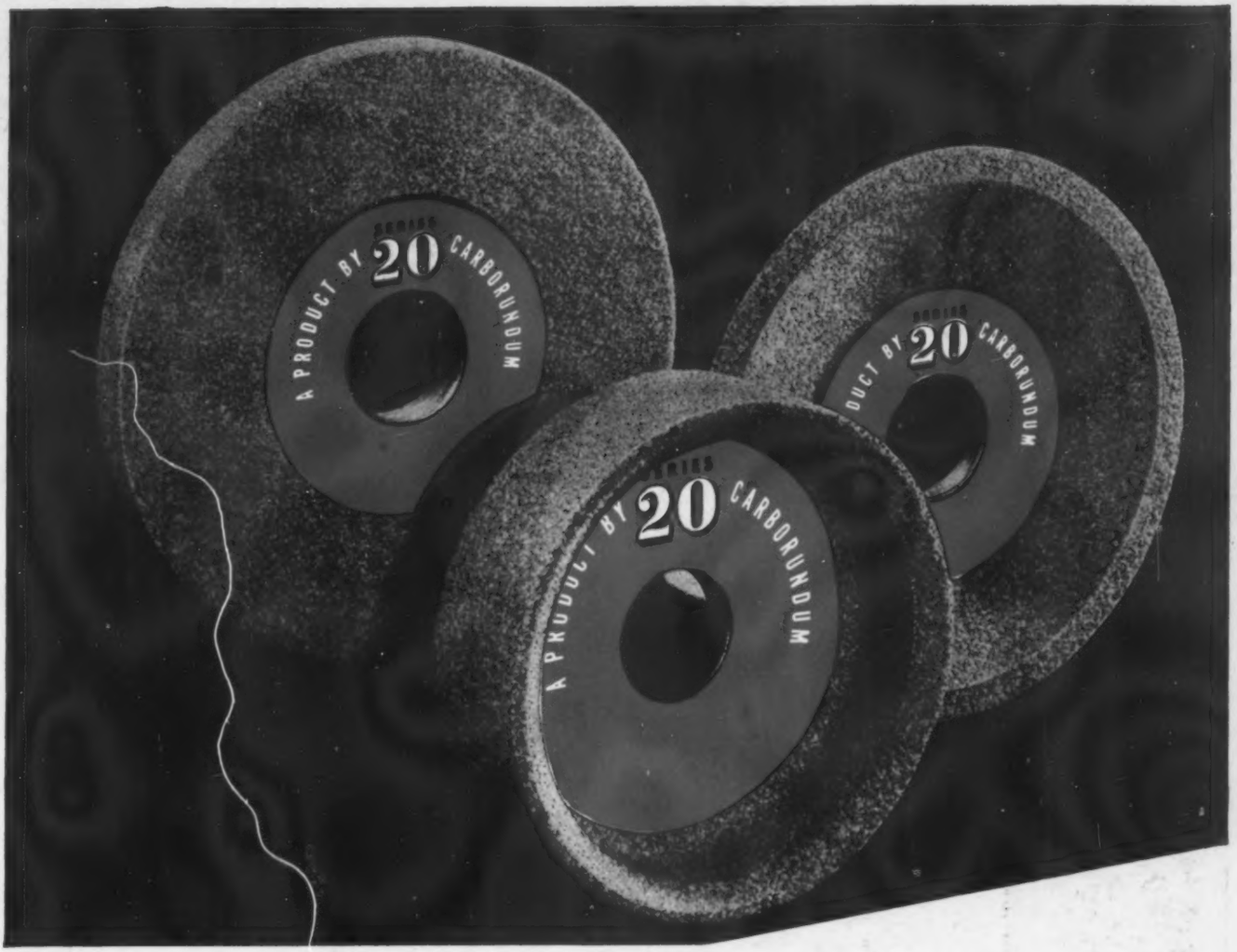
PRESENTING:

"SERIES 20" GRINDING WHEELS

An Important Development by the leading name in Abrasives

CARBORUNDUM

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company



Setting new, higher standards of grinding while effecting production savings, "Series 20" is now ready for announcement. Of many important advantages, seven stand out. Briefly, they are:

1 Faster Stock Removal
2 Improved Tool Finishes
3 Fewer Damaged Tools . . . Less Scrap
4 Cooler Cutting Action
5 Longer Tool Life . . . between grinds
6 Increased Skill for Operators
7 Lower Wheel Inventory

As a development of the technical laboratories of The Carborundum Company, "Series 20" has exceeded all expectations. Tests have been conducted under a variety of conditions in a diverse list of factories. Especially for tool room use, "Series 20" represents one of the most progressive accomplishments of modern abrasive engineering.

In specifying "Series 20" for better grinding, the range of work classifications includes surface grinding, wet or dry operations, tool and cutter grinding and surface form grinding. A choice of standard sizes and shapes is available to meet the specific requirements of modern machine applications and grinding techniques. Yet, because "Series 20" covers a broad range of grinding, the actual needed inventory stocked can be smaller.

To be sure of the best grading for your specific grinding jobs, we suggest talking it over with one of our representatives. This is the best way we know to get started right on the use of "Series 20." In the meantime, to get a more complete story on "Series 20," send at once for our new booklet "Check List for Better Grinding." The Carborundum Company, Niagara Falls, New York.

A Good Rule for Good Grinding . . . CALL IN

CARBORUNDUM

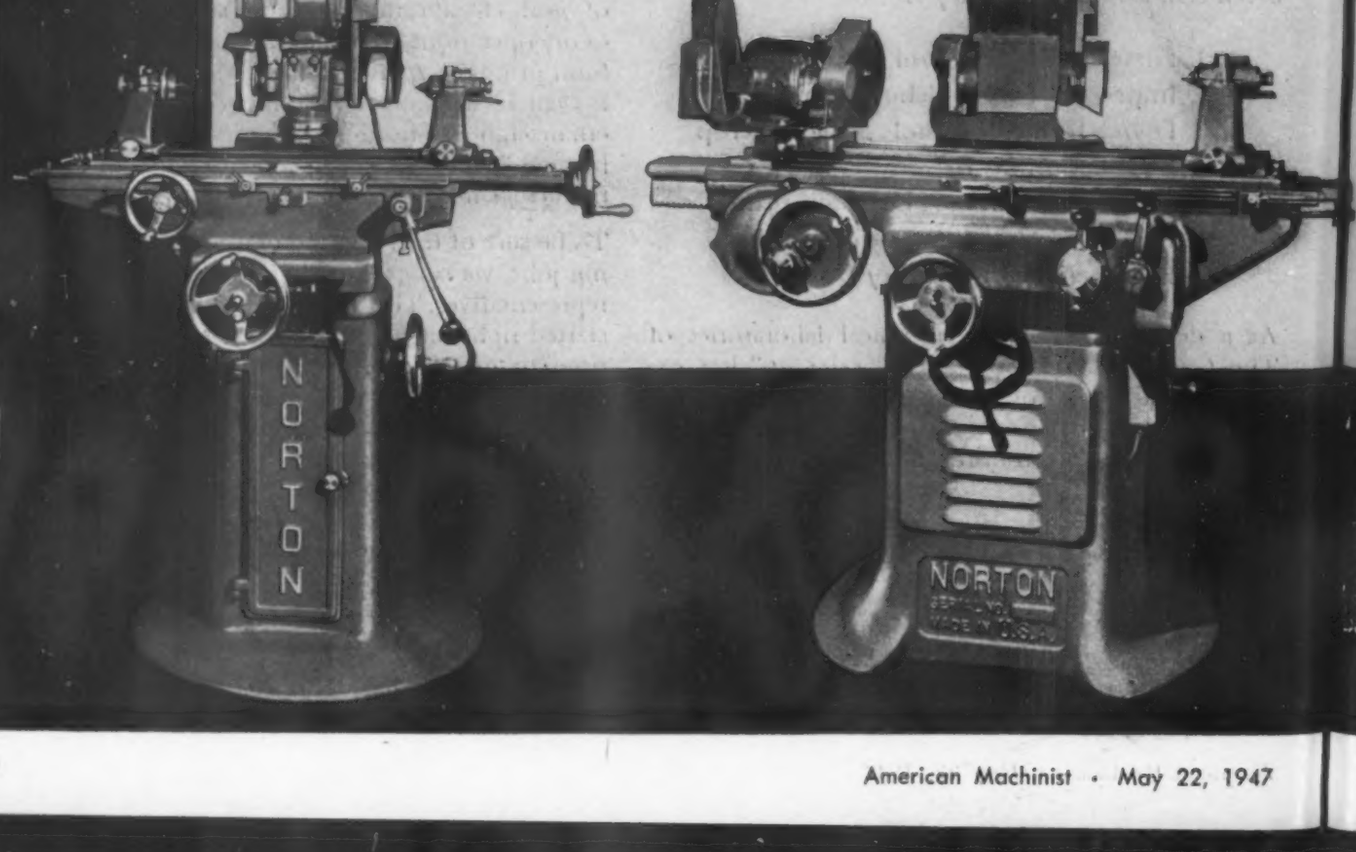
TRADE MARK

Are You Grinding Tools and Cutters?

NORTON has 3 Tool and Cutter Grinders *that Really Do a Job!*

Norton No. 1 Tool and Cutter Grinder arranged with Left and Right Hand Footstocks.

Norton No. 2 Universal Tool and Cutter Grinder arranged with hydraulic Table Traverse, Motor Drive Work Head, and Right Hand Footstock.



FROM lengthy experience, Norton knows the qualities that must be built into these machines.

For this reason, no matter what your tool room jobs may be — from the simplest cutter and reamer grinding to the more diversified jobs always present in the large tool room — you can be sure that one of these Nortons will meet your requirements.

For the operator's ease and the saving of his time — and yours — they all have duplicate controls. For keeping your maintenance and overall cost factors low, they are simply but sturdily made. Norton tool and cutter grinders are now delivering topnotch performance in hundreds of tool rooms in widely known plants. Why not let them perform this same service for you?

Write for catalogs on any one or all three.

NORTON COMPANY, WORCESTER 6, MASS.

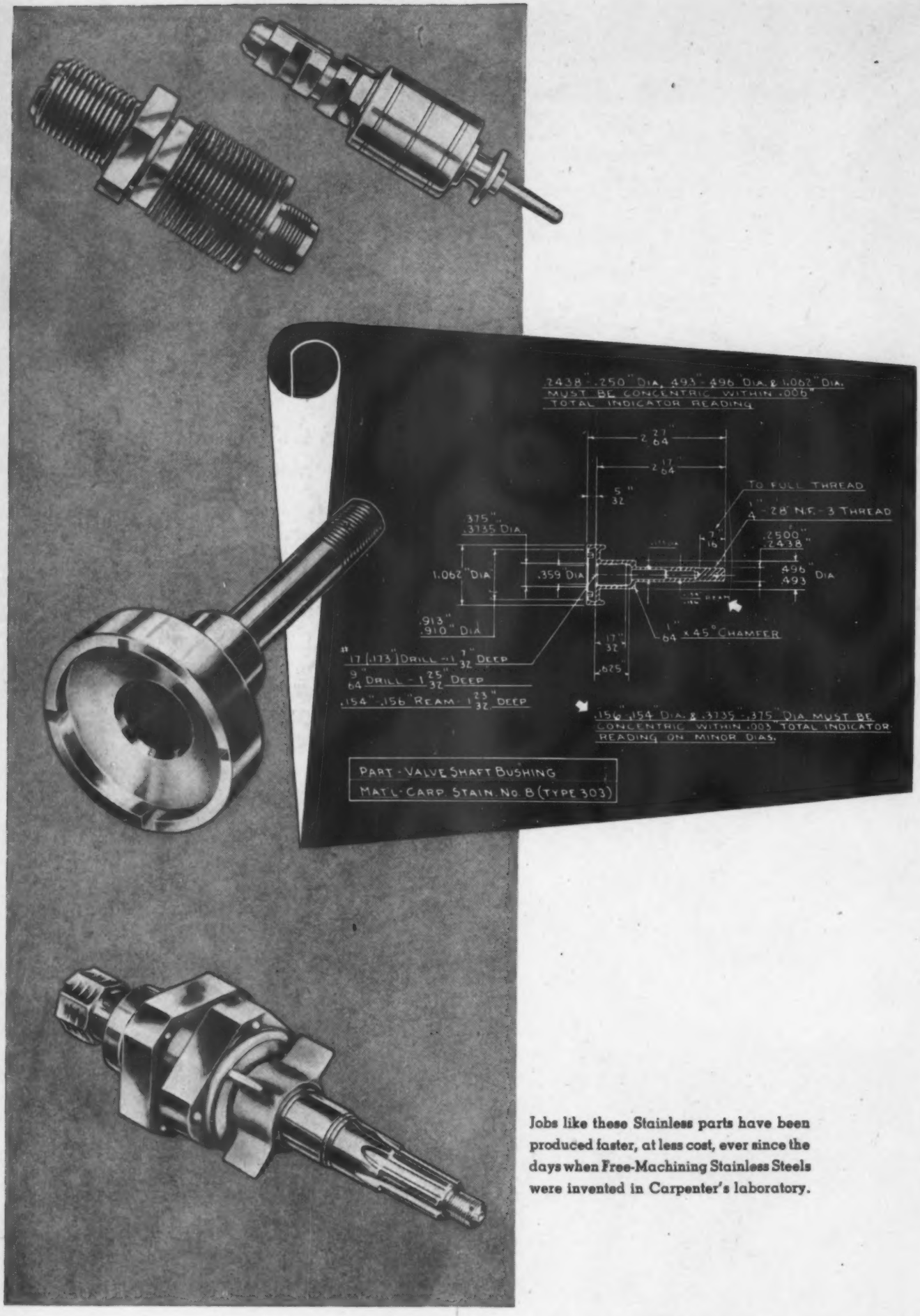
New York - Chicago - Detroit - Cleveland - Hartford

Distributors in All Principal Cities

M-543

Norton No. 2 Cutter and Tool Grinder arranged with Left and Right Hand Footstocks.

NORTON GRINDERS and Lappers


.2438" - .250" DIA, .493" - .496" DIA & 1.062" DIA. MUST BE CONCENTRIC WITHIN .005" TOTAL INDICATOR READING
2 27/64"
2 17/64"
5/32"
TO FULL THREAD
1/4" - 28 N.F. - 3 THREAD
.375"
.3735 DIA
7/16"
.2500"
.2438"
1.062" DIA
.359 DIA
1/4"
.496"
.493" DIA
.913"
.910" DIA
17/32"
.625"
1/64" x 45° CHAMFER
#17 (.173") DRILL - 1 7/32" DEEP
9/64" DRILL - 1 25/32" DEEP
.154" - .156" REAM - 1 23/32" DEEP
.156" .154" DIA. & .3135" - .375" DIA MUST BE CONCENTRIC WITHIN .003 TOTAL INDICATOR READING ON MINOR DIAS.
PART - VALVE SHAFT BUSHING
MAT'L - CARP. STAIN. NO. 8 (TYPE 303)

Jobs like these Stainless parts have been produced faster, at less cost, ever since the days when Free-Machining Stainless Steels were invented in Carpenter's laboratory.

One of the best ways we know to keep unit costs in line on Stainless machining jobs is to *combine uninterrupted production with consistently good finishes.*

And that means every operation must run smoothly from beginning to end—whether you're turning, drilling, tapping, threading, milling, broaching or reaming Stainless. It means you are aiming for fewer rejects on each inspection. To put yourself on the way to lower unit costs with Stainless, take these two steps now.

1. First, lower costs with Stainless depend to a great extent upon the Stainless you use. Absolutely uniform Stainless bars are the only kind that will really flow through your machines, keep you free from costly tooling troubles. And *uniformity* is just what you get with Carpenter Free-Machining Stainless—bar after bar, lot after lot. So specify *Carpenter* on every order for Free-Machining Stainless bars.

how to get HIGH PRODUCTION and GOOD FINISHES on Stainless Machining Jobs....

2. Take full advantage of the accurate and useful information that Carpenter has developed through years of experience with Stainless machining jobs. You'll find a lot of that experience in the "Notebook On Machining Stainless Steels"—available to Production and Management executives from the offices listed below. If you would like a personal copy, call your Carpenter representative. Extra copies of the NOTEBOOK for the men in your plant are available at 50¢ apiece.

THE CARPENTER STEEL COMPANY, 109 W. BERN STREET, READING, PA.

Carpenter

FREE-MACHINING

STAINLESS STEELS

CALL TODAY FOR PROMPT SHIPMENT FROM CONVENIENTLY LOCATED STOCKS

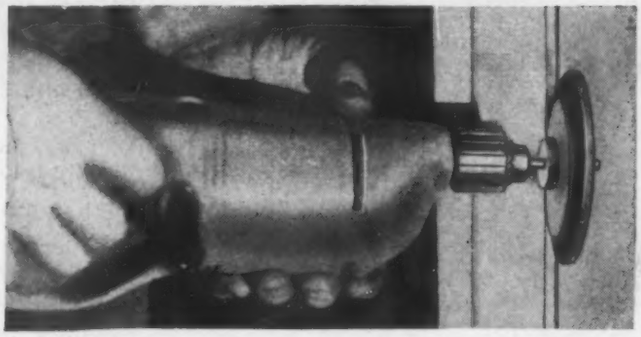
Baltimore Boston Buffalo Chicago Cincinnati Cleveland
Dayton Detroit Hartford Indianapolis Los Angeles
New York Philadelphia Providence St. Louis Worcester, Mass.

SEE THE CLASSIFIED SECTION OF YOUR TELEPHONE DIRECTORY

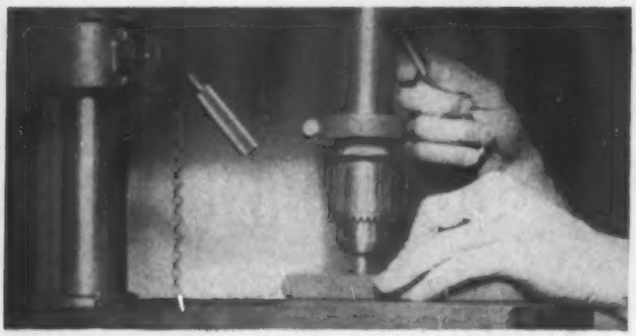
MODERN ABRASIVE PRODUCT CUTS PRODUCTION STEPS:

Increases Man-Hour Output

TUBING "Blending in" welded seams, removing heat marks, cleaning, finishing and prepolishing—all in one operation. The Brightboy finish often constitutes the final polish.



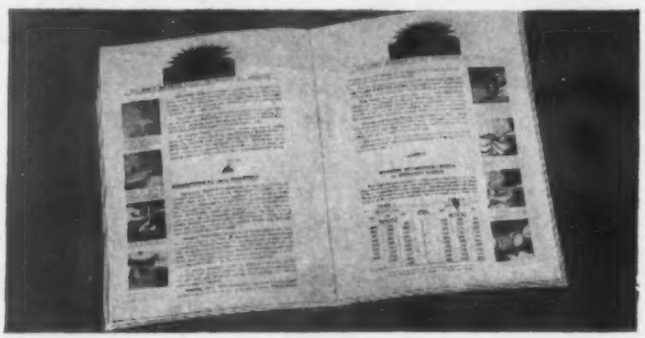
GROOVES Narrow Brightboy wheel simultaneously burrs, smooths and polishes sides and bottom of grooved surface. (Any edges, screw or punched holes in the piece are also burred at the same time.)



DAMASKEENING Brightboy rod chucked in drill press for spotting design on flat surface of cigarette cases, compacts, machine parts, clock faces, etc.

THREADS Brightboy hand table, held against part in machine chuck, quickly removes burrs and cleans threads.

RE-FINISHING Brightboy's resilient rubber and abrasive combination saves time and costs in cleaning and polishing the flutes of taps and drills.



PROCEDURE Castings, stampings, drawn, machined and molded parts are *finished faster* with Brightboy. The Brightboy Catalog Manual gives countless work-procedure examples.

THESE illustrations depict a few of many short cuts in the manufacture of products of Metal, Plastics and Wood, through the use of Brightboy—THE MODERN FINISHING MEDIUM. BRIGHTBOY'S resilient rubber and abrasive combination achieves work-saving results by *simultaneous* BURRING, FINISHING and POLISHING. A Brightboy service representative will be glad to call to discuss operation short cuts. Ask your regular dealer or write us for the Brightboy Catalog-Manual and Price List.

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
Newark 7, N. J.

WELDON ROBERTS Brightboy

Why do so many manufacturers use and prefer Timken Bearings?

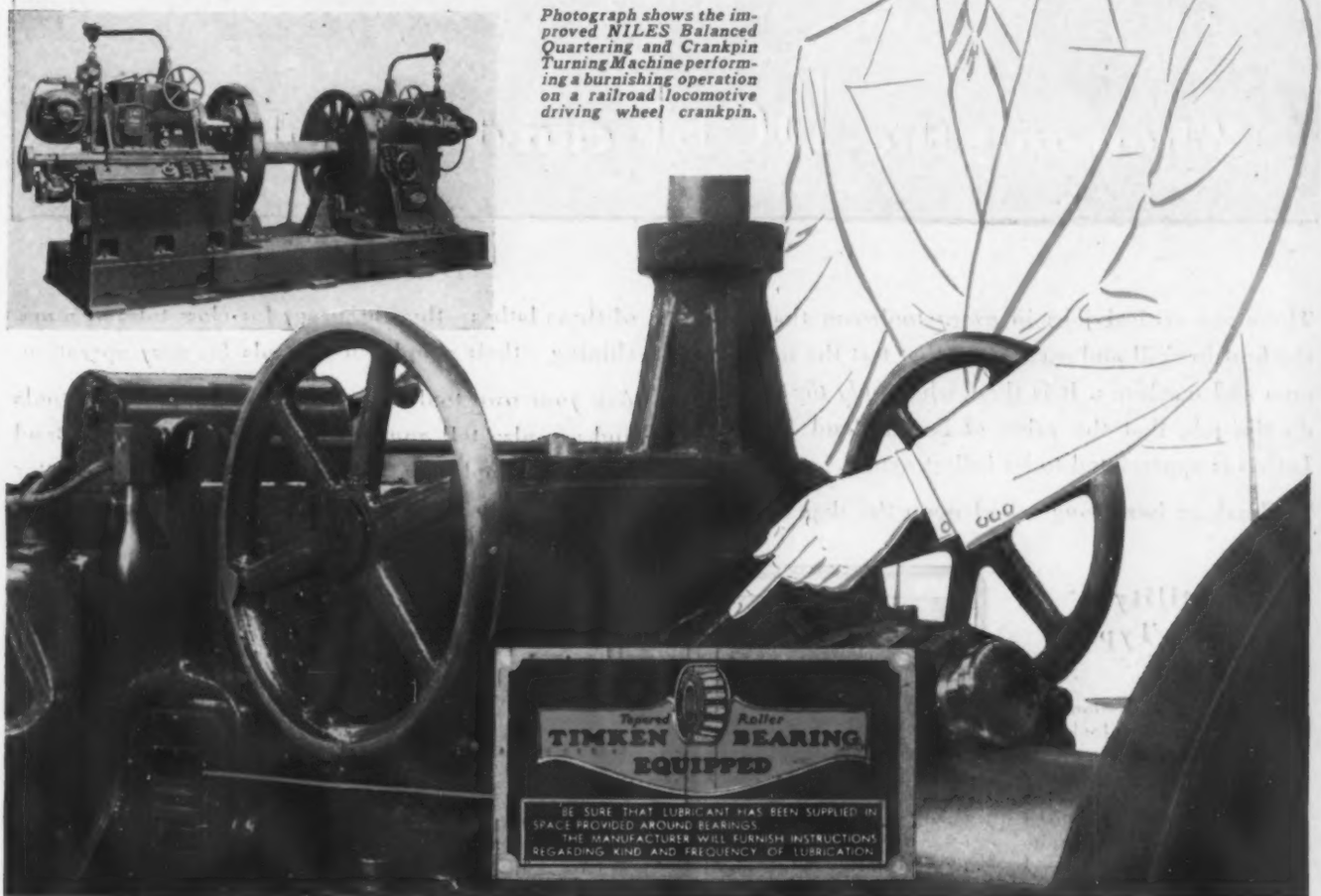
In practically every major industry Timken Tapered Roller Bearings are the first choice of engineering executives.

They are to be found delivering amazing performance in every kind of machinery — in gigantic steel mills, machine tools, construction equipment, oil field equipment, paper-making equipment — in fact wherever wheels and shafts turn.

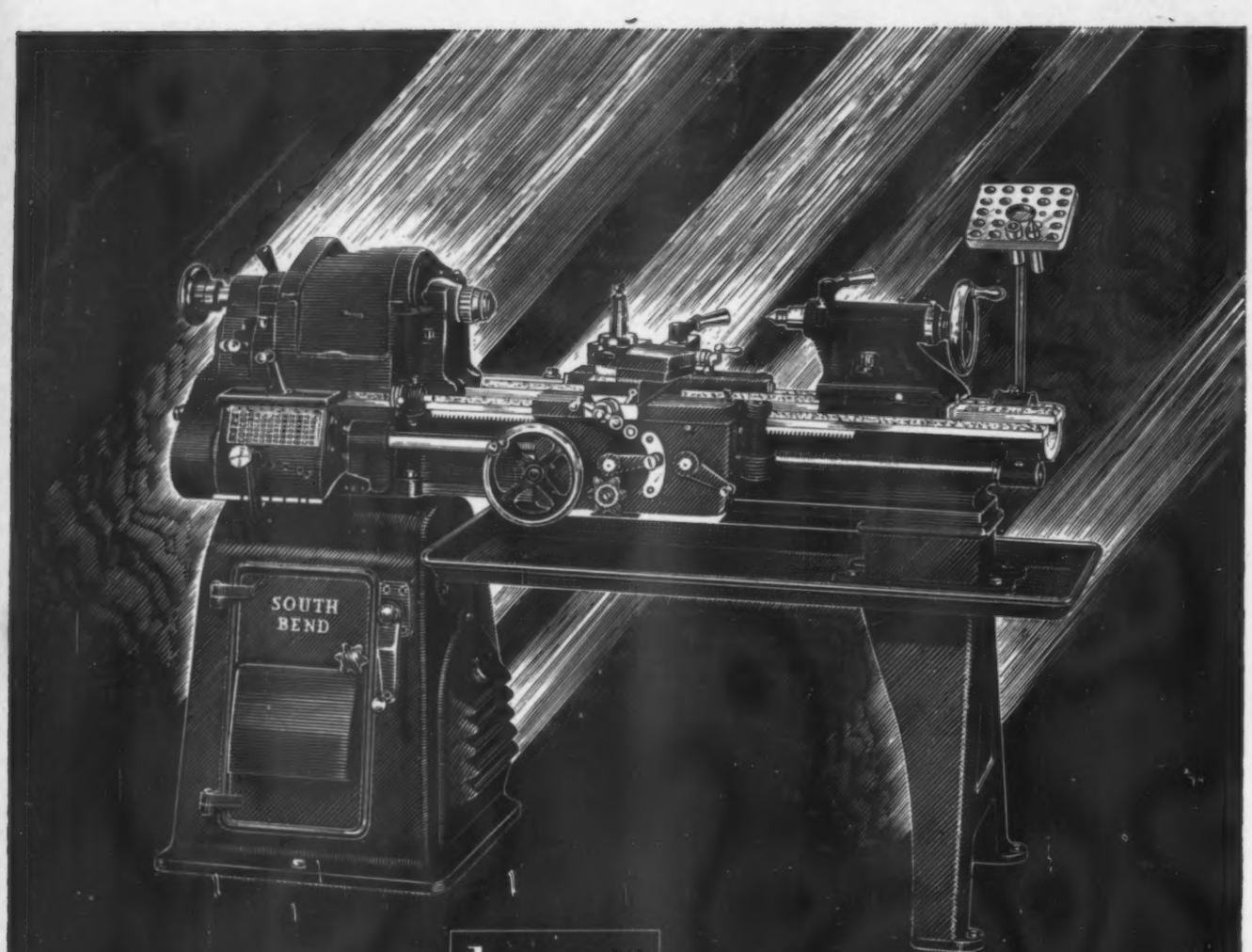
Timken Bearings likewise are preferred by sales executives, but for a different reason. They have found it is easier to sell any kind of machine when they tell their prospects it is Timken Bearing Equipped, for the trade-mark "TIMKEN" means "All there is in bearings" the world over.

Thus when you buy Timken Bearings you know you will have the enthusiastic approval of everyone concerned. The Timken Roller Bearing Company, Canton 6, Ohio.

Photograph shows the improved NILES Balanced Quartering and Crankpin Turning Machine performing a burnishing operation on a railroad locomotive driving wheel crankpin.


Tapered Roller
TIMKEN BEARING
EQUIPPED
BE SURE THAT LUBRICANT HAS BEEN SUPPLIED IN SPACE PROVIDED AROUND BEARINGS. THE MANUFACTURER WILL FURNISH INSTRUCTIONS REGARDING KIND AND FREQUENCY OF LUBRICATION

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST →◎← LOADS OR ANY COMBINATION →◎←



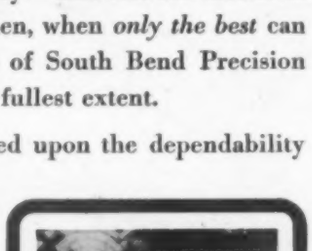
When only the best can do the job

There are critical jobs in every toolroom that exact the best in skill and accuracy—that test the mettle of men and machines. It is then, when *only the best* can do the job, that the value of South Bend Precision Lathes is appreciated to its fullest extent.

Toolmakers have long relied upon the dependability of these lathes—their accuracy for close-tolerance machining—their simplified controls for easy operation.

Ask your own toolmakers. They know precision tools and can also tell you in what other ways South Bend Precision Toolroom Lathes can contribute to better craftsmanship on your tools, dies, and fixtures.

Versatility for All Types of Work



The range of applications for South Bend Precision Toolroom Lathes is exceedingly comprehensive. Maximum efficiency and utility in the machining of all materials is produced by the wide selections of spindle speeds, power transverse feeds, power longitudinal feeds, and thread cutting feeds that are provided. South Bend Precision Toolroom Lathes are built with 9", 10", 13" (see top illustration), 14½", and 16" swings. Complete information concerning them is contained in Catalog 100-F which will be mailed upon request.

South Bend Lathe Works

BUILDING BETTER LATHES SINCE 1906

419 EAST MADISON STREET
SOUTH BEND 22, INDIANA

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

The Boston and Maine Railroad is washing cars automatically at the rate of one a minute between revolving brushes with a water spray.

get ready with CONE for tomorrow

The sound-on-wire principle has been applied to a unit made by Sound Media to be used with billboards or displays.

be ready with CONE for today

Permanete Metals Corp. is experimenting with a magnesium blasting powder that is said to be insensitive to shock and not ignited by sparks.

get ready with CONE for tomorrow

The new Bendix-Stromberg carburetor compensates for changes in atmospheric pressure as in mountain driving.

be ready with CONE for today

Bendix Radio Division's new Type PAR-3 receiver weighs only one and a half pounds and is particularly suitable for small aircraft.

get ready with CONE for tomorrow

New York City's Third Avenue Transit Corporation is shifting from rail cars to buses and will use 700 General Motors 44-passenger diesel buses.

be ready with CONE for today

An electronic "stop watch" developed at Yale University is said to measure the speeds of particles accurately to a thousand millionth of a second.

get ready with CONE for tomorrow

Hudson Products Co. of Detroit makes a grinder with a 3-inch silicon-carbide grinding wheel driven by a water motor that can be attached to any faucet.

For crippled veterans, International Business Machines Corp. has devised an electrically operated artificial arm.

get ready with CONE for tomorrow

North American Phillip Co. is developing an arc welding technique that can be used by unskilled workers.

be ready with CONE for today

Aerojet Engineering Corp. predicts the use of its rocket power for the stopping and starting of heavy machinery.

get ready with CONE for tomorrow

The Bureau of Standards has a new gel capable of detecting one part in 500 million of CO.

The Whiting Corp. of Harvey, Illinois, has an electric hoist that will lift a ton but weighs only 87 pounds.

be ready with CONE for today

American Gas Accumulator Co. is making an inexpensive, breakable runway light for airports that shatters, if struck, without damaging the plane.

get ready with CONE for tomorrow

Dow Chemical Co. has used a solution of calcium chloride to freeze-proof carloads of coal in transit.

be ready with CONE for today

Diamond Instrument Co. is making a portable seismograph, particularly for highway surveys and constructions.

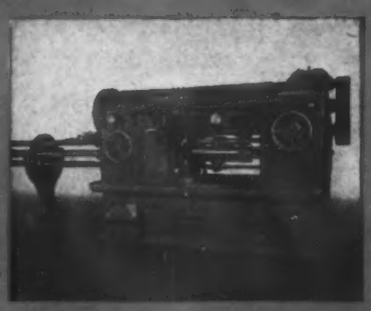
get ready with CONE for tomorrow

New Hampshire Ball Bearings Inc. is the first in this country to put the new ultra-small precision ball bearings into mass production.

FOLLOW THESE PAGES FOR NEWS OF PROGRESSIVE PRODUCTION

Give *ordinary* jobs to any automatic. Put the *special* ones on a CONE.

From 1¾" dia. SAE 1112, a 6-Spindle Conomatic, with 11 tools, produces the piece shown in 56 seconds.

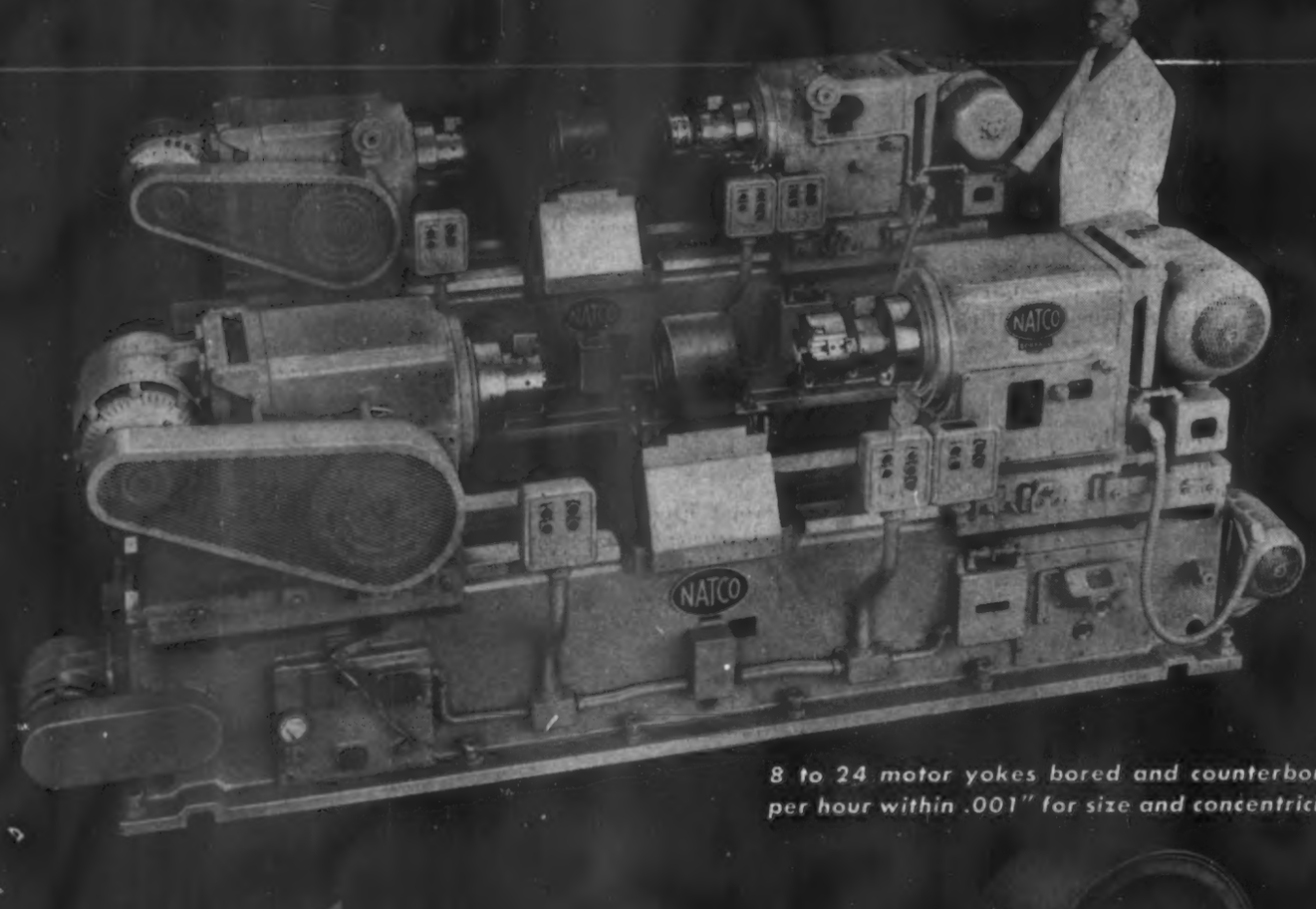


Ask your CONE representative to show you our new color motion picture

CONE

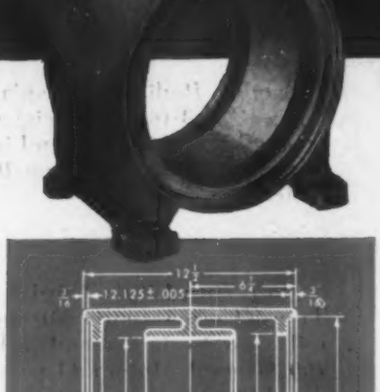
AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

How new NATCO BORFACE Unit Machines...



8 to 24 motor yokes bored and counterbored per hour within .001" for size and concentricity

Example 1 for an electric motor manufacturer



The newly developed NATCO A20A BORFACE Units make possible multi-way type precision boring and permit for the first time the rapid production of accurate bores in large hard-to-handle castings by semi-skilled operators.

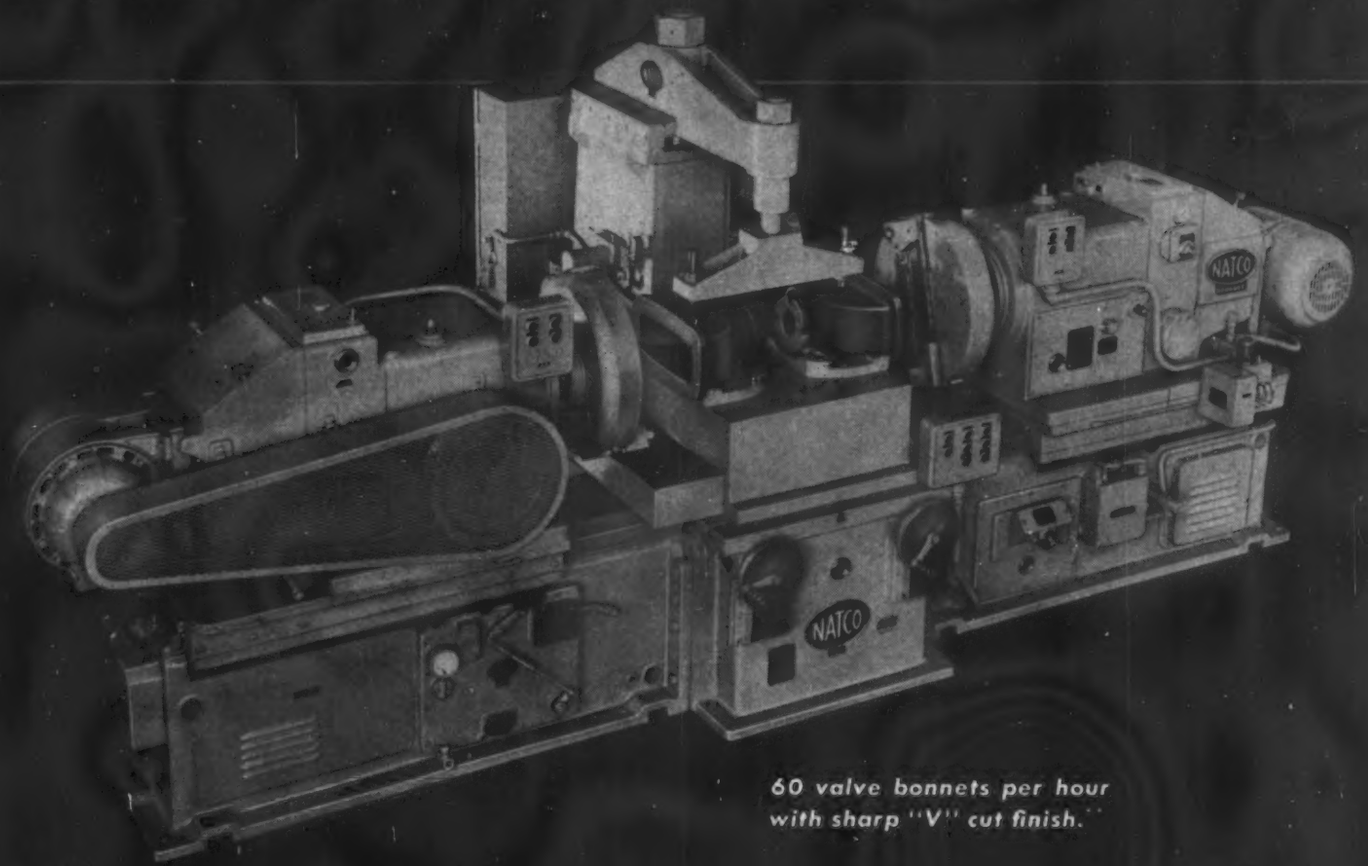
The two BORFACE machines above were built for an electric motor manufacturer and are arranged for rough and finish boring a range of 8 sizes of cast iron N.E.M.A. frame motor yokes having a minimum central bore of 7" to 11⅛" diameter with counterbore varying from 9¾" to 14⅛" diameter. Depth of counterbore is 5/16".

Machine in the foreground is constructed of 2 model A20A BORFACE Units for rough boring and counterboring using AC drive motors for the spindles, and machine in background is a duplicate except it is driven by DC motors to permit variable speed in a wide range for maximum cutting efficiency and fine finish in final bore and counterbore operations held to limits of ±.001".

Write Today for your Colorful New FREE Booklet!

The complete story of these newly perfected BORFACE unit machines is now ready for immediate distribution in complete illustrated form. Write NATCO, Department A, Richmond, Ind.

...precision turn, bore and face large, cumbersome parts faster, better



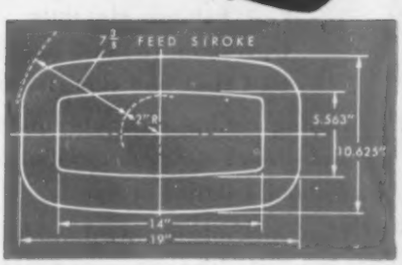
60 valve bonnets per hour with sharp "V" cut finish.

Example 2 for a valve and fitting manufacturer

NATCO A20B BORFACE Units provide the same spindle construction as the A20A machine except for the cross facing drive and control unit. On the BORFACE machine shown here a two-way operation has been provided for a prominent manufacturer of valves and fittings which permits facing 2 bonnets simultaneously. This operation calls for a machine that can cut a flat surface with "phonograph" finish so as to bite into gaskets and hold under pressure.

The application of NATCO automatic clamping makes possible faster loading and unloading of awkward parts and eliminates the large cumbersome revolving cradle type fixtures usually found on other machines attempting this work.

Investigate this type of equipment where work is large and awkward to handle or swing on boring mills and lathes.



NATCO DRILLING, BORING AND TAPPING MACHINES

NATCO

NATIONAL AUTOMATIC TOOL COMPANY, INC., RICHMOND, IND., U. S. A. • *Branch Offices:* 1809 Engineering Building, Chicago • 409 New Center Building, Detroit • 1807 Elmwood Avenue, Buffalo • 2902 Commerce Building, New York City

CROSS *Transfer-matics* will Affect the Price of Your New Car!

(A)

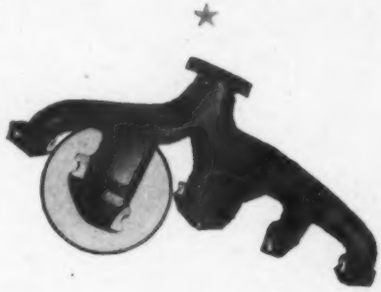
(B)

Briefly speaking, Transfer-matics reduce production costs; they help provide better things for more people at a lower price.

An example is the 3-station Transfer-matic above which Cross supplied to one of the largest producers of automobiles for machining manifolds.

Part: Exhaust Manifold.

Operation: (A) Mill back face of 8 mounting bosses and (B) form mill 8 stud slots and side clearances—all at the same time.



During cutting cycle operator removes completed manifold, reloads a new part and presses the button—*93 manifolds net hourly* (16 operations, 1,488 surfaces)—without a skilled operator.

Naturally this increased productivity and lower cost per piece are reflected in the sales price. The consumer benefits, and so does the producer.

Perhaps we can help you too.

THE **CROSS** COMPANY

Established 1898

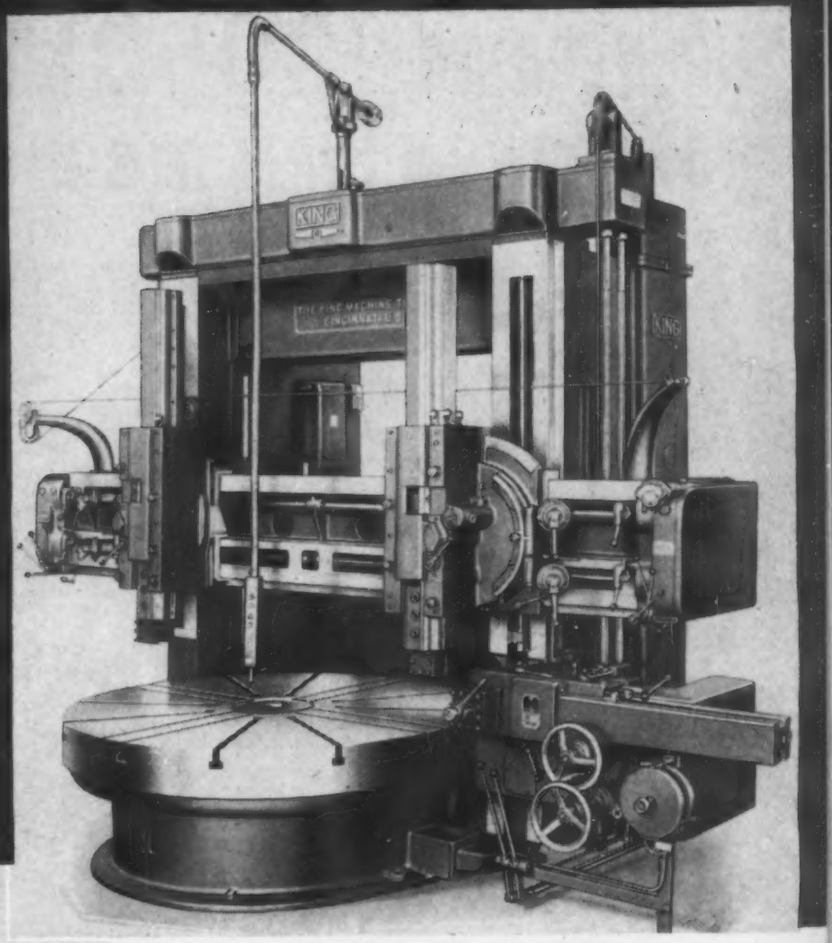
©1947—THE CROSS COMPANY

SPECIAL MACHINE TOOLS

DETROIT 7, MICHIGAN

MILLING • DRILLING • TAPPING • BORING • TURNING • SHAPING • GRINDING • HONING

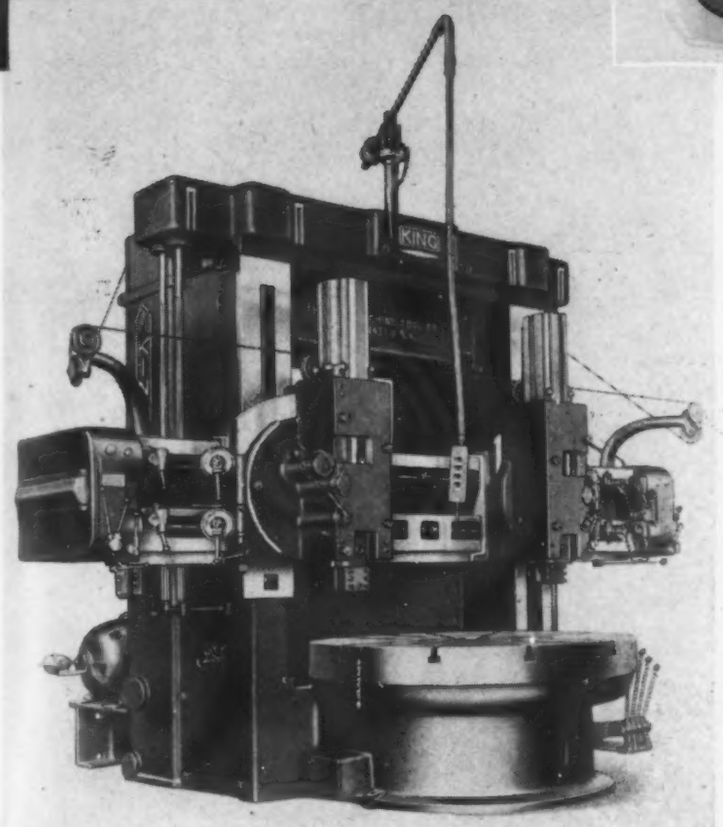
KING VERTICAL BORING AND TURNING MACHINE



Illustrating the New Series 100" Right and 72" Below

●

Here massive construction and flexibility combine to provide precision and high production



● Today when speed, power and rigidity are essential to obtain the best results from carbide tools you'll find King Vertical Boring and Turning Machines have all three.

With a substantial weight increase throughout —with new rectangular type rams—with a heavy tie plate across the swivel you get the utmost rigidity—precision and smooth finished work.

They have ample power to take deep roughing cuts at high speeds and then take an exceptionally smooth finishing cut easily—quickly—economically.

To meet today's competitive conditions investigate the King for speed—precision—and low costs.

Available in ten sizes: Single column 30", 36", 42", Double column 52", 62", 72", 84", 100", 120", 144".

THE KING MACHINE TOOL COMPANY

CINCINNATI 29, OHIO

Builders of Vertical Boring and Turning Machines Exclusively

NO NEED TO "CODDLE" A ROBERTSON GRINDING WHEEL

No matter what your grinding problem may be, you can probably find half a dozen wheels that will produce satisfactory results—if you can afford to spend the time and effort to "coddle" them.

But that's expensive.

Much better results can be obtained by discussing your grinding needs with a Robertson Sales Engineer who will help you select the most suitable wheel for the job—a wheel that will produce the desired finish or take the necessary cut with the minimum of effort on the part of the operator.

Robertson wheels are made by precision methods for precision results, resulting in faster and more accurately-ground work. Experience has shown that many users reduce their tool-grinding costs, as a consequence, by as much as ten to twenty percent.

A copy of the booklet "How to Buy Production-Time" is yours for the asking. You will find it crammed with helpful, useful information prepared to help you make your Tool Room operations more efficient. Write for a copy.

ROBERTSON COOL-CUT

ROBERTSON MANUFACTURING COMPANY
TRENTON 5, NEW JERSEY

Manufacturers of Vitrified Grinding Wheels • Mounted Wheels • Segments

NOT HOW MANY PIECES but HOW MANY *Dollars*

ALL EMPHASIS, for nearly a decade, has been on production—how many finished pieces could be counted at the end of the day—more often than not a working day of 24 hours. Overtime charges, high machine maintenance, scrap loss—all these were negligible factors—get production regardless of cost!

Now, with the return of competitive selling, the picture is changed. Certainly manufacturers want production, but they want it as a means of holding down costs. They want high machine production at the end of a regular 8-hour working day. They want production without paying high overtime rates to get it. They want production without high expense for tool breakage or machine maintenance and repair. They want to minimize charges for scrap loss due to inaccuracy, or work spoilage under pressure for volume.

To get that kind of production—low cost production—requires machine tools that are truly efficient—fast, accurate, rugged.

In the metal turning field, a Warner & Swasey field engineer can aid in detecting machine tools which, weighed against today's requirements, are no longer profitable producers. Warner & Swasey gladly offers you the services of these experienced field men at a time when low-cost production is so important to our national economy.

You can machine it better, faster, for less... with a Warner & Swasey

WARNER & SWASEY
Machine Tools
Cleveland

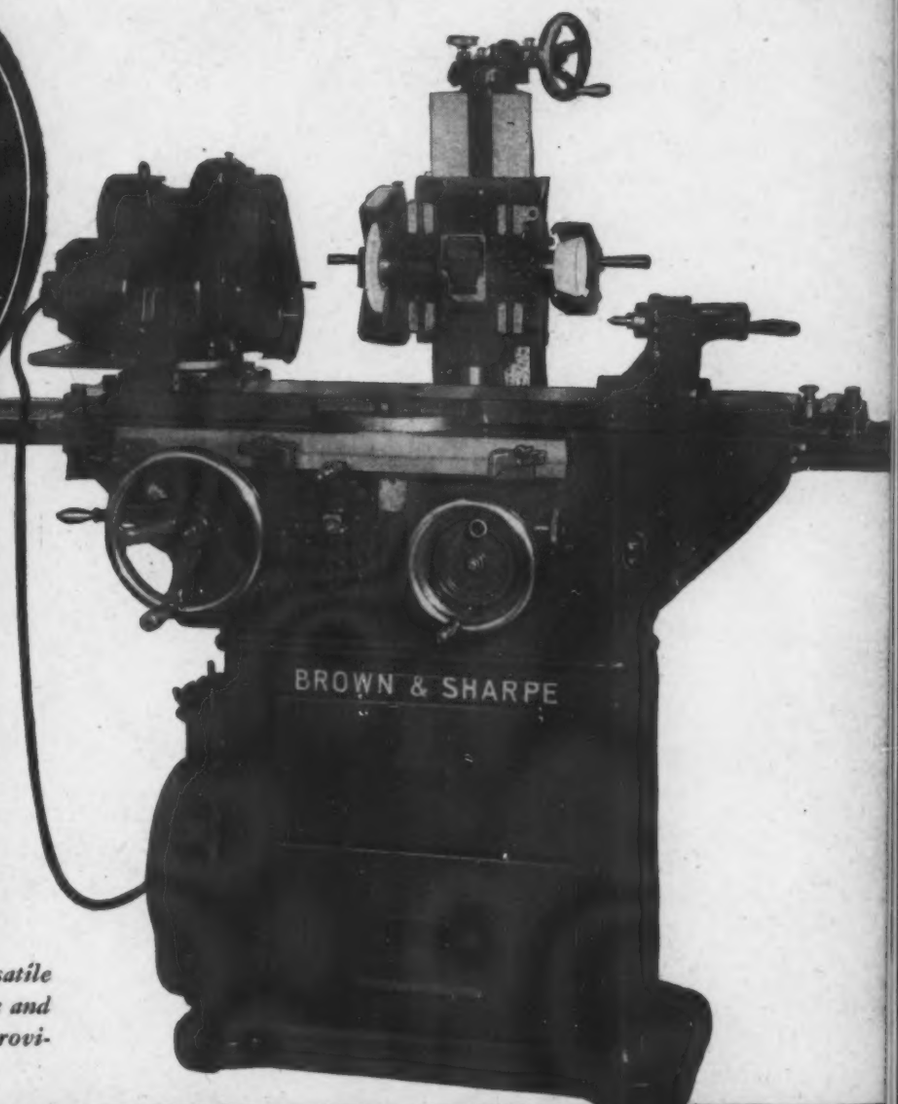
TURRET LATHES. MULTIPLE SPINDLE AUTOMATICS. PRECISION TAPPING AND THREADING MACHINES

BROWN &

PAYS ITS WAY . . . . IN MANY WAYS

• The No. 13 is one of the busiest machines in any shop . . . for such toolroom operations as grinding small and medium size cylindrical work, form grinding and a multitude of miscellaneous grinding jobs . . . including sharpening milling cutters, reamers and similar tools.

WIDE SELECTION OF ATTACHMENTS TO SPEED GRINDING ON CERTAIN CLASSES OF WORK . . . for sharpening hobs, face mills and formed cutters . . . for surface, internal and wet grinding . . . and an exhaust attachment.



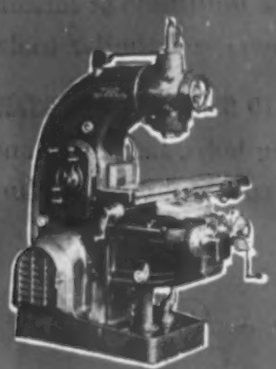
CIRCULAR FORMING TOOL GRINDING EQUIPMENT... Widely used to grind circular forming tools of plain or intricate design and radial and angular forms on the periphery of cylindrical or tapered pieces. Forming tools ground on the No. 13 with this equipment produce more pieces per sharpening, with uniform accuracy throughout the life of the tool.

Above: Through a magnifying glass operator follows the grinding of a forming tool on the No. 13 with the Circular Forming Tool Grinding Equipment.

Write for complete information on the versatile No. 13 Universal and Tool Grinding Machine and its attachments. Brown & Sharpe Mfg. Co., Providence 1, R. I., U. S. A.

& SHARPE B·S

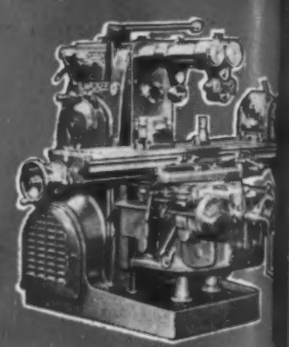
Big Choice Gives



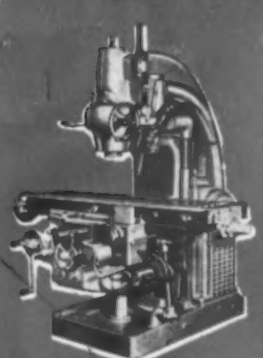
MODEL 1H Swivel Head Vertical —Also available in Plain, Universal, Automatic Cycle Plain and 18" Manufacturing types.

MODEL 2HL Universal — Also available in Plain and Swivel Head Vertical types and in Automatic Cycle Plain type.

MODEL 2H Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.



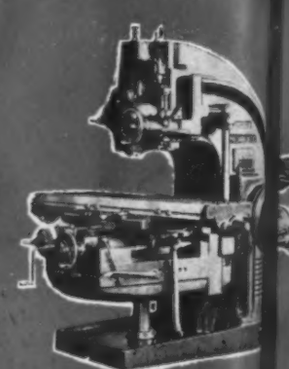
MODEL 3H Universal—Also available in Plain and Vertical and in Automatic Cycle Plain Vertical types.



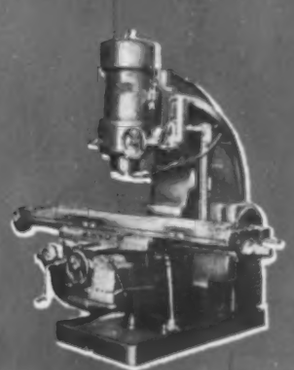
MODEL 2K Vertical Automatic Cycle—Also available in Plain and Vertical types and in Automatic Cycle Plain type.

MODEL 3KM Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.

MODEL 3K Universal—Also available in Plain and Vertical types and in Automatic Cycle Plain and Vertical types.



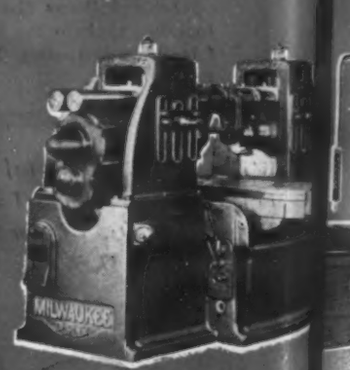
MODEL 4K Vertical—Also available in Plain and Universal and in Automatic Cycle Plain Vertical types.



MODEL 50 C5M Vertical — Also available. Plain and Automatic Cycle Plain and Vertical types. Choice of 2 working ranges.

MODEL M-24 Simplex—Available with 18" - 24" or 30" longitudinal travel to table — in Simplex models only.

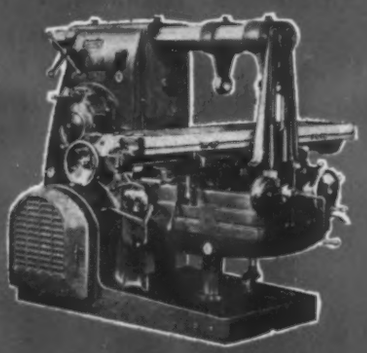
MODEL 1200 Simplex—Available in both Simplex and Duplex models with 24" - 36" or 48" longitudinal travel to table.



MODEL 1600 Duplex—Available in both Duplex and Simplex models. Choice of 24" - 36" - 54" longitudinal travel to table.

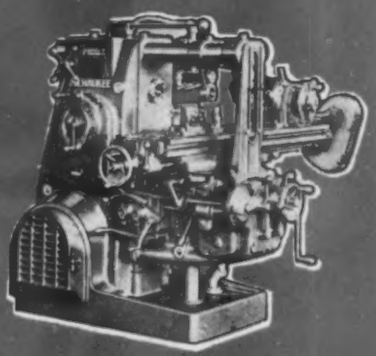
es You Better Buy!

ODEL 4H Vertical—Also avail-
ble in Plain and Universal types
nd in Automatic Cycle Plain and
ertical types.

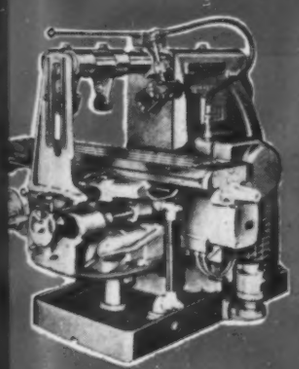


MODEL 5H Plain—Also available in Universal and Vertical types and in Automatic Cycle Plain and Vertical types.

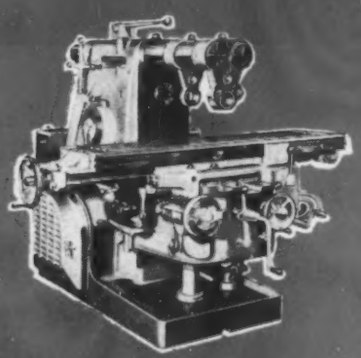
MODEL 2D Rotary Head Milling Machine.—One size and working range only. Especially suited to precision tool and die work.



MODEL 2KM Universal — Also available in Plain and Vertical types and in Automatic Cycle Plain and Vertical types.

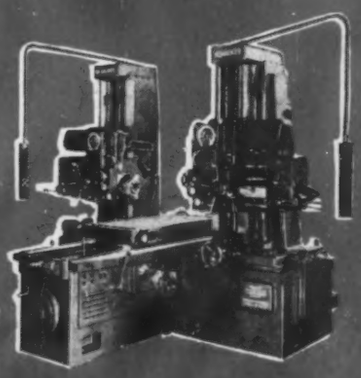


ODEL 20 CSM Plain—Also avail-
le in Vertical and Automatic
cle Plain and Vertical types.
oice of 2 working ranges.



MODEL 30 CSM Plain Automatic Cycle—Also available: Plain, Vertical and Automatic Cycle Vertical types. Choice of 2 working ranges.

L No. 3T Precision Milling
oring Machine—Adjustable
rovides 12" travel for bor-
erations.



MODEL No. 3TT Precision Milling and Boring Machine—2 columns and headstocks for multi-operation work on single workpiece.

Kearney & Trecker

Milwaukee Milling Machines — 97 Different Models, Sizes and Types mean the right machine for your job

There's a Kearney & Trecker for every milling job — in small shops, high production plants or precision tool rooms. Horsepowers range from 3 to 50 with wide working ranges and broad feed and speed ranges to suit.

Model K machines are general all-purpose machines. Model H machines are the intermediate type. The new CSMs are the most powerful standard milling machines ever built — specifically designed for carbide milling of steel, but suited for all-purpose work as well. For high speed production you can get the Manufacturing types in conventional, Simplex and Duplex models.

You'll find the Rotary Head Milling Machine and Models No. 3T and 3TT Precision Milling and Boring Machines are ideal for the specialized shop. To meet unusual or special machine requirements, there's Kearney & Trecker Customer Engineering Service where you get the benefit of nearly fifty years experience in precision and production machine tool design and manufacture.

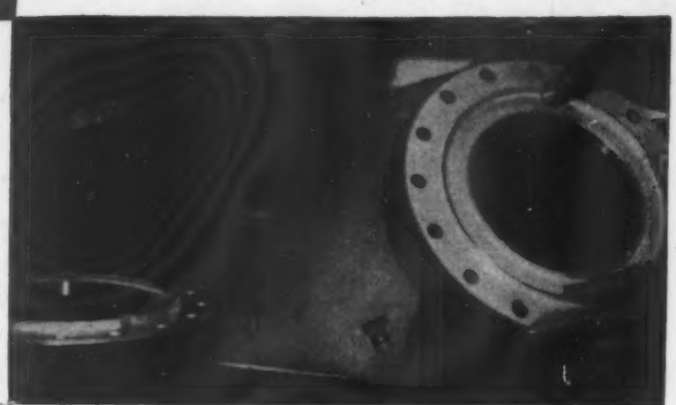
Catalog E-53 gives you complete data on our entire line — Write for it! Please indicate your business connection.

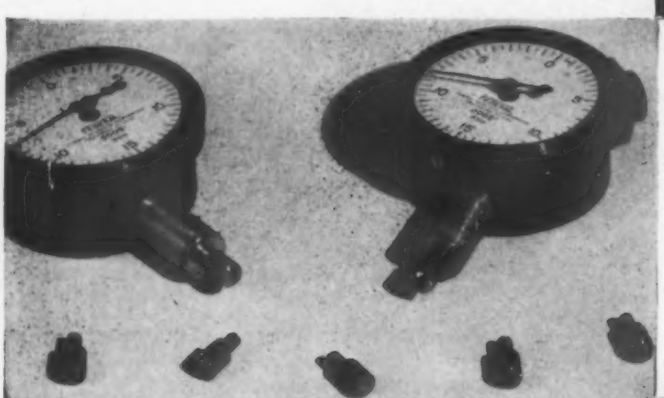
KEARNEY & TRECKER
CORPORATION
Milwaukee 14, Wisconsin 479A

If there is a Wear Surface on a Gage...
Wear-resistant **NORBIDE** *parts save Time and Money*

NORBIDE Gages are made of Norton Boron Carbide—the hardest material commercially produced—and it is this hardness which gives them their wear resistance. A NORBIDE plug gage measuring aircraft engine parts lasted 17 months where tungsten carbide lasted 14 days, chrome plated gage eight hours, tool steel gage four hours.

A new application of NORBIDE pieces is shown at the right where three rectangular NORBIDE inserts were used on an angle face plate. On last report this gage had been in service for six months of checking for truth or run out as well as diameters of aircraft engine flanges. The hardened steel plate formerly used required resurfacing every 24 hours.

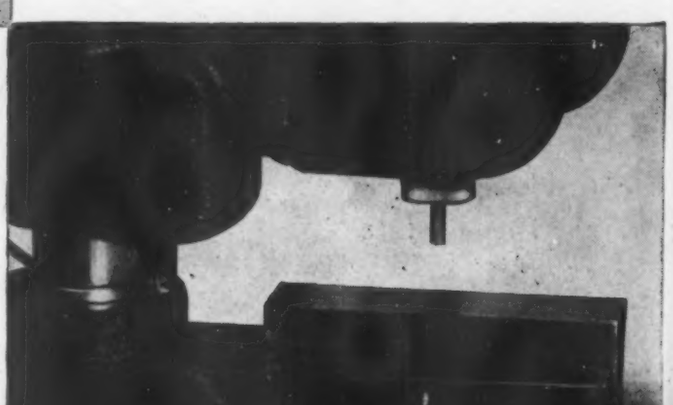




Contact points for dial indicator gages is a common use for NORBIDE shapes. NORBIDE gages will not pick up lint nor become charged with particles of metal. They are inert to chemicals ordinarily employed where gages are used. Because NORBIDE pieces weigh even less than aluminum, NORBIDE gages that are held in the hand cause much less fatigue.

NORBIDE inserts are successfully used in the anvils of many gages. Because of their great wear resistance these anvils do not have to be constantly resurfaced, wear tolerances are eliminated and rejects are cut to a minimum. Ask your regular supplier about NORBIDE Gages or write to:

NORTON COMPANY
WORCESTER 6, MASS.

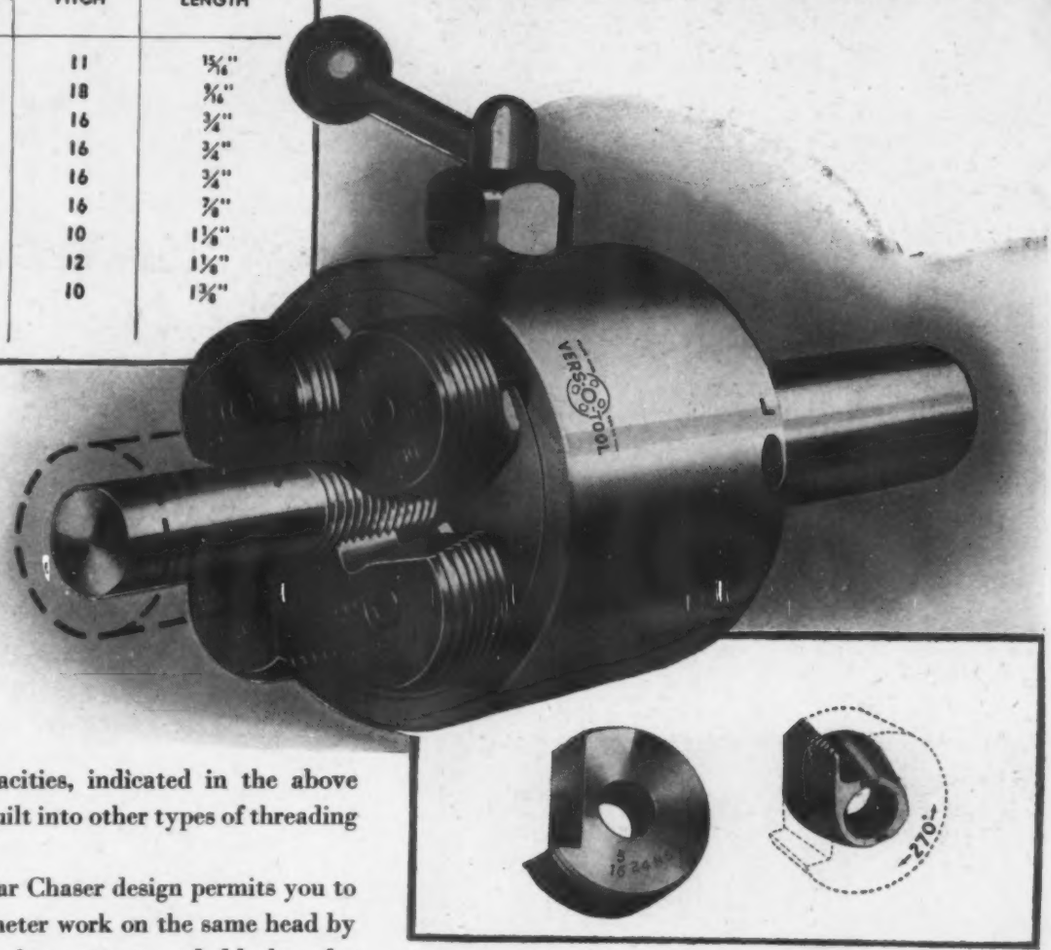


NORBIDE – The Hardest Material Made by Man
T. M. REG. U.S. PAT. OFF.

How to reduce tool investment with VERS-O-TOOLS

STANDARD CAPACITY	OVERSIZE CAPACITY	MAX. PITCH	MAX. LENGTH
3/8"	5/8"	11	15/16"
5/8"	1 "	18	9/16"
13/16"	1 3/16"	16	3/4"
1 "	1 3/8"	16	3/4"
1 1/16"	1 1/2"	16	3/4"
2 "	2 3/8"	16	7/8"
2 3/8"	3 "	10	1 1/8"
3 5/8"	4 1/4"	12	1 1/8"
4 7/8"	5 1/2"	10	1 3/8"

(Ask for complete oversize table)



The oversize capacities, indicated in the above table, cannot be built into other types of threading heads.

Only the Circular Chaser design permits you to handle larger diameter work on the same head by merely changing the cutters and blocks—for either threading or hollow milling.

Here is a Vers-O-Tool plus value—an important saving in tool costs.

Ground Thread Circular Chasers provide 4 to 10 times more cutting life than any other type of chaser. They may be reground through 270° circumference. Chasers, mounted on blocks, are replaced in one minute, without disturbing the work or changing its accuracy.

Vers-O-Tools are hardened and ground throughout—fast, high-precision, long-lived, profit-making tools.

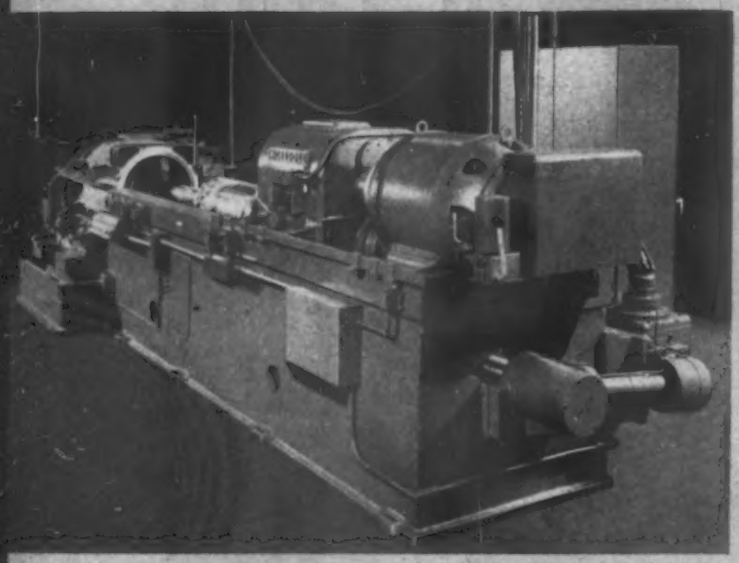
Catalog D-42-C gives complete details.

The NATIONAL ACME CO.

170 EAST 131st STREET · CLEVELAND 8, OHIO

SEE THIS EQUIPMENT DEMONSTRATED
Booth 628
Machine Tool Show
CHICAGO—SEPT. 17-26

SPECIAL INGER



Rough boring the pole faces, boring and facing the end holes of an electric motor frame for Diesel locomotives are all exacting jobs. This Ingersoll machine with a special eccentric fixture and multiple tool boring bar does all of these jobs simultaneously.

Diesel locomotive beds are heavy, awkward weldments having more than a dozen pads that must be milled accurately. This 55-ton Portable Ingersoll Milling Machine can be placed over the locomotive bed on the erecting floor and removed by crane when the machining is complete.

600 to 1

These are the odds that you will not be interested in buying any of the five machines on these two pages. It happens they were all designed and built for different manufacturers of Diesel Locomotives.

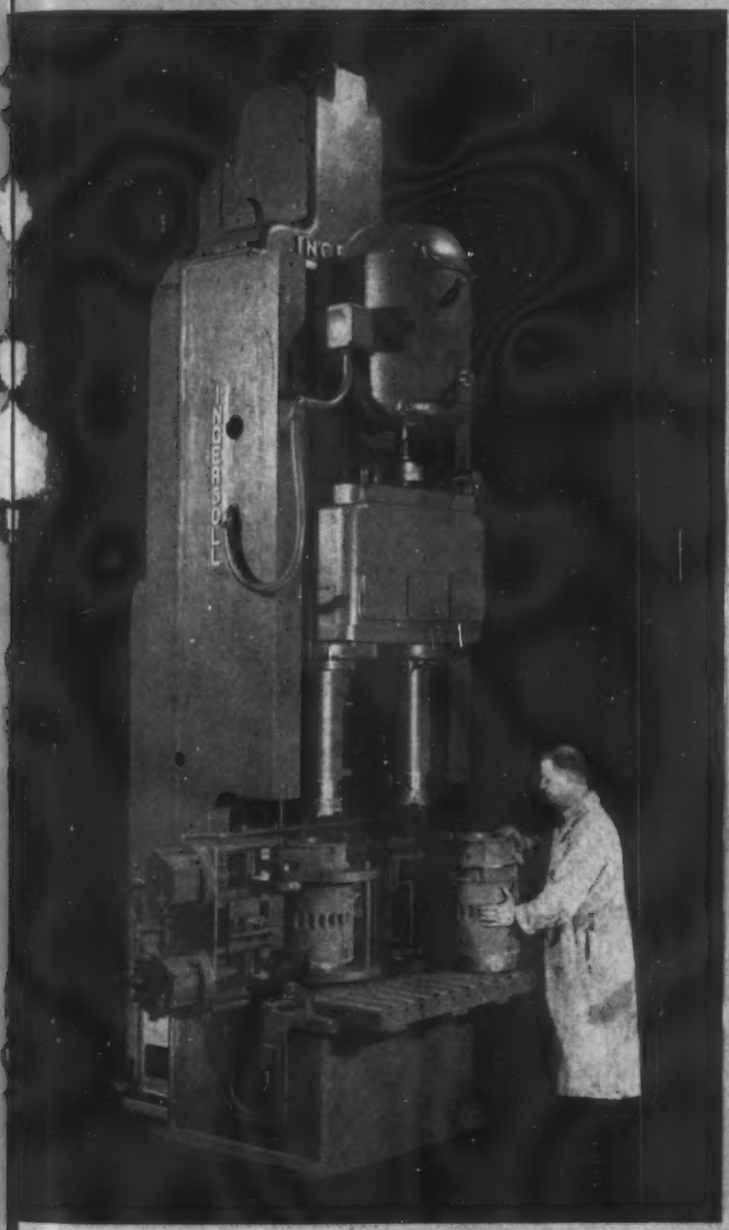
Each was built complete with work-holding devices and cutters, and the production from the complete unit was guaranteed.

Each represents a combination of our customers' production experience and that which we have acquired in designing and building a great variety of special tools for more than half a century.

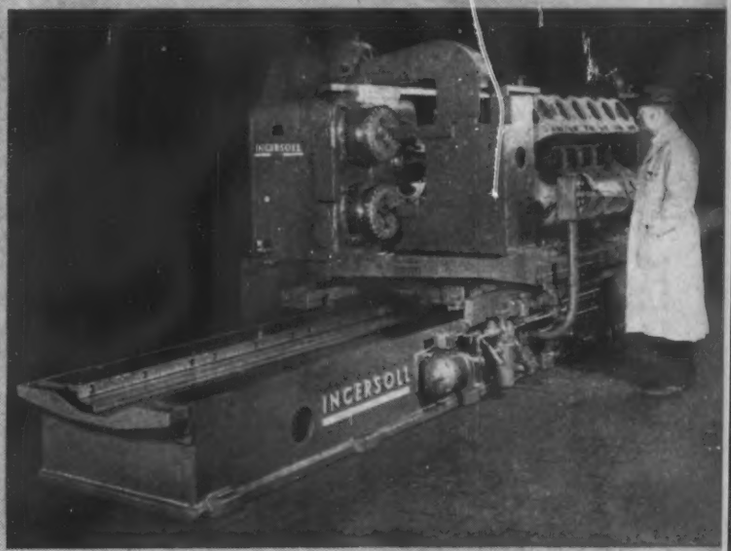
This experience is our greatest asset. It is ready to serve you.

THE INGERSOLL MILLING

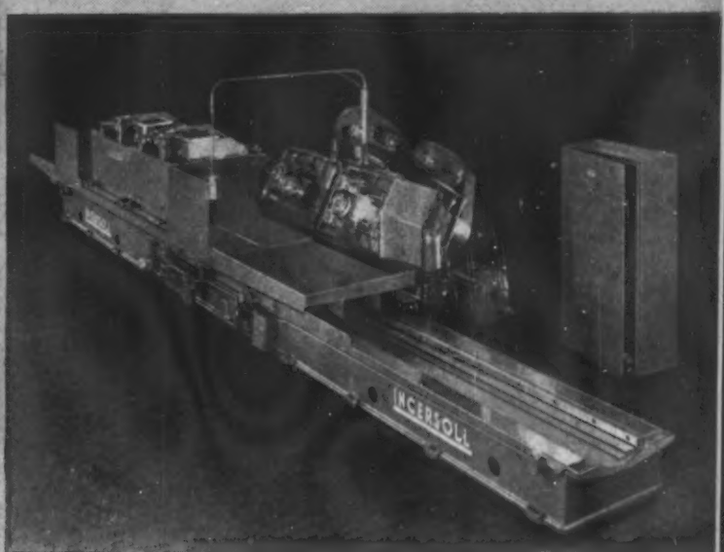
SOLL EQUIPMENT



This Ingersoll Cylinder Sleeve Boring Machine equipped with air-operated fixture and special Ingersoll boring tools rough bores twenty-six 8½" diameter sleeves an hour and bores them so accurately that the finishing operations are performed economically and with an excellent finish.

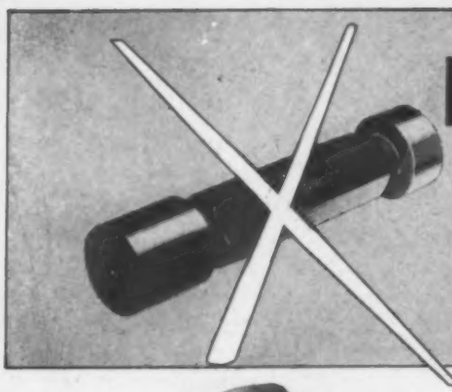


The pan rail and the bearing lock on both eight and twelve cylinder cast iron Diesel engine blocks can be milled on this Ingersoll equipment. A combination of Ingersoll Shear Clear and End Mill cutters is used. Machine, fixtures and cutters were built and tested in our shop before shipment.



Thirteen surfaces at different levels and angles on a Diesel locomotive electric motor frame are rough and finish milled with this Ingersoll 8-spindle Milling Machine, which weighs 75,000 pounds. The cutters are heavy duty Ingersoll Shear Clear face mills and Type NX end mills. Accuracy, speed and dependability are built into this equipment.

G MACHINE CO., ROCKFORD, ILLINOIS



DuBo Gages are going over!

Orders and re-orders demonstrate DuBo superiority over cylindrical plug gages

DuBo* Plug Gage

checks bores FASTER, more accurately!

SINGLE END
Sizes 1.510" to 6.010"
(38 mm. to 152 mm.)

DOUBLE END
Sizes .240" to 1.510"
(6 mm. to 38 mm.)

Enthusiastic users all over the country are rapidly replacing cylindrical plug gages with DuBo Gages. The first use unmistakably demonstrates DuBo superiority — its extreme lightness, its ability to detect dimensional deviations (taper and out-of-roundness), its ease, speed and accuracy. STANDARD representatives in leading industrial centers will gladly arrange a demonstration for YOU.

WRITE FOR BULLETIN *Patents Pending

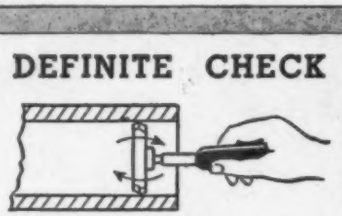
LIGHT IN WEIGHT

DuBo Gages weigh 70% to 80% less than cylindrical plug gages of equivalent size. Lighter weight means less fatigue, greater accuracy.

EASY TO ENTER

DuBo is entered easily by tipping handle slightly above bore axis (no jockeying necessary). Enters even under-sized bores easily.

DEFINITE CHECK



Enter gage, rock handle gently, bringing spherical gaging surface in contact with bore wall. Whether or not handle drops freely below center is definite yes-or-no answer.

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

UNI

GEAR CUTTERS AND HOBS

Standard gear, worm gear and spline shaft hobs for all makes of machines . . . involute cutters in standard sets or single purpose designs for both roughing and finishing . . . single and straddle-tooth sprocket wheel cutters in American Standard forms — UNION has them all in a complete range of sizes, made with Union metallurgical and toolmaking skill that couples high production with high accuracy. Make Union your "toolroom" for every gear cutting need.

STORES
New York: 61 Reade Street
Chicago: 11 So. Clinton Street
Detroit: 3527 Woodward Avenue
San Francisco: 121 Second Street
Los Angeles: 524 E. Fourth Street
Seattle: 568 First Avenue, So.

UNION TWIST DRILL CO.
ATHOL MASS.
S. W. Card Mfg. Co. Division, Mansfield, Mass.
Butterfield Division, Derby Line, Vt. and Rock Island, Que.

REAMERS by Butterfield

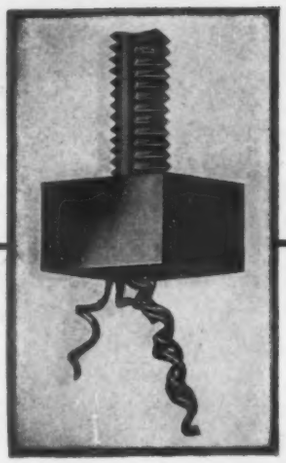
Illustrated: Straight and Spiral Fluted Hand Reamers, Straight and Spiral Fluted Chucking Reamers, Straight and Spiral Fluted Expansion Reamers, Lok-Tite Expansion Chucking Reamers.

Butterfield assures you of dependable efficiency and the most rigid standards of accuracy — your guarantee of high-quality, trouble-free performances in heavy duty reaming operations.

Butterfield Division

Derby Line, Vt. Rock Island, Que.

UNION ★ BUTTERFIELD ★ CARD



CARD

HAND TAPS

FORCING THE CHIPS *ahead* OF THE TAP . . .

Above is a detailed view of chip-action produced by Card Spiral Pointed Hand Taps. Long, curling chips are forced ahead of the Tap – avoiding clogging – increasing strength of Tap – reducing breakage.

S. W. Card Mfg. Co.
Mansfield, Mass.

Divisions of the Union Twist Drill Company

DRILL HARDENED STEEL WITH ACE "Hi-Brine[illegible]" DRILLS

Carbide tipped drills from 17/64"

[illegible]bide drills in sizes up to 1/4".

Ace "Hi-Brinell" Drills are designed and manufactu[illegible] especially for drilling steel hardened to a Rock[illegible] C40-C65 and above. • These drills have ample ne[illegible] tive rake thus eliminating thin projecting angles a[illegible] permitting a faster flow of heat from the cutting edges. Negative rake also adds to the ruggedness of the drill. • The *solid* carbide drill has an extra heavy web. • Reclaiming costly dies is only one of the many profitable applications for Ace "Hi-Brinell" Drills.

ACE DRILL CORPORATION

MANUFACTURERS OF GROUND-FROM-THE-SOLID DRILLS AND REAMERS

DETROIT 27, MICHIGAN

Ace also produces spiral fluted drills with spiral carbide tips for drilling abrasive non-ferrous materials.

GROUND FROM THE SOLID

2392

It's UNIFORMITY that counts in a free cutting rod

Uniformity of dimension, shape and surface smoothness are readily evident in a free cutting rod. Not so obvious, however, but far more important to the manufacturer of screw machine products, are those desirable but unseen characteristics; uniform *composition*, uniform *temper* and uniform *metal structure*. For on these depend the physical properties of the part, the excellence of its machined finish, and the economy of its production through sustained high cutting speeds.

The American Brass Company produces a large number of Anaconda Copper and Copper Alloy Rods in all commercial sizes and shapes suitable for screw machine use. Sixteen are free cutting alloys. The "special purpose" properties of six of these are indicated on the following page. 47113

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

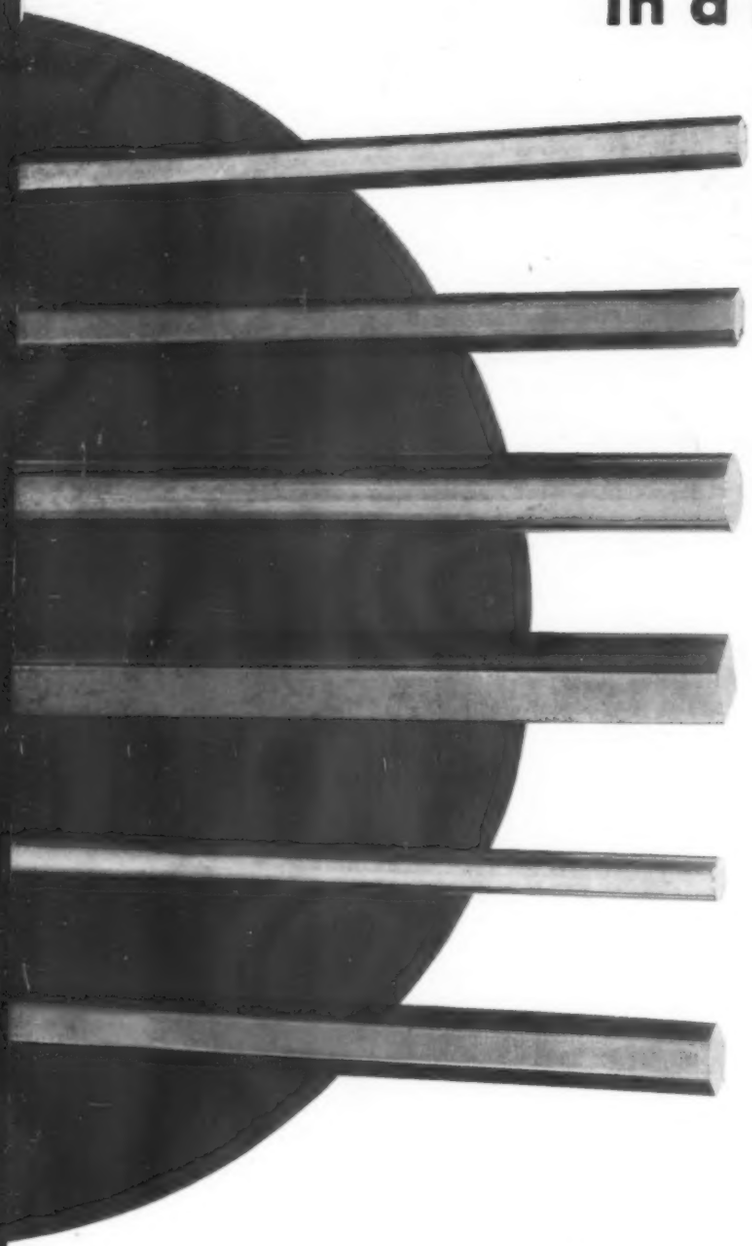
In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

ANACONDA

from mine to consumer

Anaconda **FREE CUTTING RODS**

What do you need most in a FREE CUTTING ROD



- **Maximum Machinability?** Free Cutting Yellow Brass 271. The standard all-purpose rod of the screw machine industry; economical, versatile, ranking highest in machinability.

- **High Electrical Conductivity?** Leaded Copper 946. A truly free cutting copper rod having a minimum electrical conductivity of 95% I.A.C.S. in commercial hard temper.

- **Good Bearing Qualities?** Special Free Cutting Phosphor Bronze 610. Combines typical "phosphor bronze" bearing qualities with machinability close to that of yellow brass.

- **High Strength and Toughness?** Everdur* 1012. This rod provides the toughness, high strength and corrosion resistance of copper-silicon alloys with ready machinability. *Reg. U. S. Pat. Off.

- **A Ductile, Silvery White Alloy?** Leaded Nickel Silver 12% 796. Strong, tough and durable, this silvery white alloy is free cutting, yet ductile enough in proper temper to permit cold forming or spinning.

- **High Resistance to Corrosion Cracking?** High Strength Commercial Bronze 286. A relatively new Anaconda Rod combining high strength (70,000 lb. per sq. in. commercially hard drawn, up to 1") with excellent machinability and unusual resistance to corrosion cracking.

Chips machined without coolant from High Strength Commercial Bronze 286. Depth of cut, .375"; feed, .003". Illustration two-thirds scale.

Compositions, physical properties, constants and machinability ratings of all Anaconda Free Cutting Rods are listed in Publication B-14. Practical suggestions for machining copper and copper base alloys are included in Publication B-3. Either one or both will be mailed on request.

THE AMERICAN BRASS COMPANY

General Offices: Waterbury 88, Connecticut

Subsidiary of Anaconda Copper Mining Company

In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

ANACONDA

Anaconda **FREE CUTTING RODS**

Try CIMCOOL, and just watch your metal cutting costs

YOU'LL FIND this amazing new cutting fluid—this *chemical emulsion,* will save you money in your shop not one way, but *two* ways:

1. CIMCOOL COSTS LESS. It compares favorably in price with old-fashioned coolants, but that's only the beginning. Cimcool lasts longer. Being a chemical emulsion, it isn't subject to the bacterial action which breaks down ordinary oils and emulsions so quickly. And its low surface tension and non-adhesion to chips and work virtually eliminate carry off.

2. TOOLS COST LESS. Plant after plant reports increase in tool and wheel life of 50 percent — 100 percent — even 200 percent after switching to Cimcool; for this revolutionary new kind of cutting fluid combines friction reduction and cooling capacity in a degree never before attained. May we show you the evidence?

OTHER CIMCOOL ADVANTAGES

- Faster cooling allows faster cutting.
- Uniform work temperature increases accuracy.
- No fire hazard — No smoke — No slippery film.
- No chromates or other skin irritants.
- Contains long-lasting rust inhibitor.
- Covers 85% of all metal working jobs.

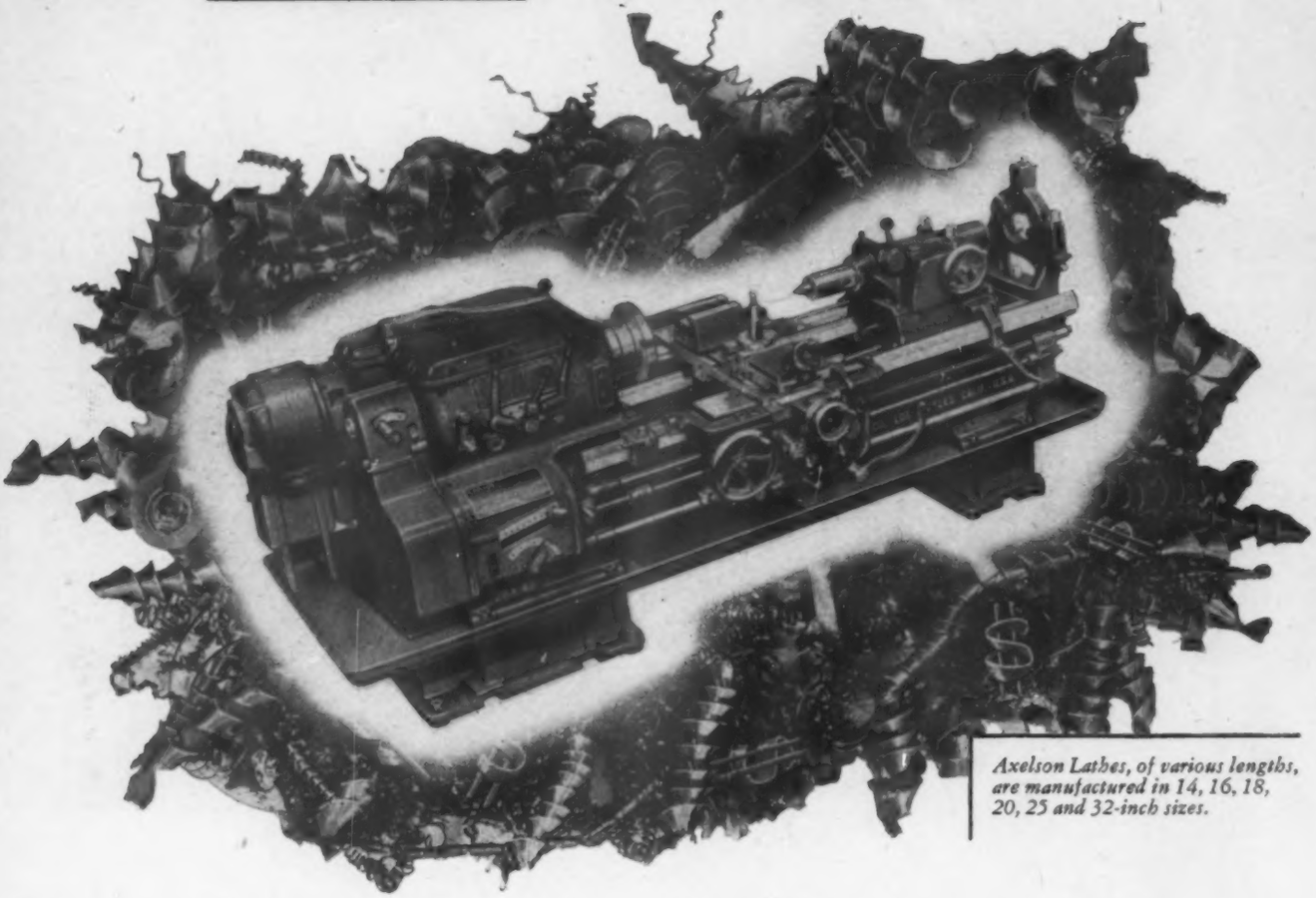
CIMCOOL

THE MULTI-PURPOSE CUTTING FLUID

Trade Mark Reg. U. S. Pat. Off.

CIMCOOL DIVISION of THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO, U. S. A.

The PROFIT $PIRAL$



Axelson Lathes, of various lengths, are manufactured in 14, 16, 18, 20, 25 and 32-inch sizes.

Today much is heard about "spirals." In metal turning, the cut comes away in real spirals of gleaming waste. A lot may be learned from examination of this waste. Look under the lathe, for small bright spring-like metal turnings, together with heavy clean-cut spirals from roughing cuts. The *Axelson heavy duty engine lathe* stands against a background of spirals, big and little: Spirals that invite expert examination, which will prove the power, versatility, speed, capacity and supreme accuracy of this great machine tool. The *spirals of profit* spinning from an Axelson Lathe, prove that this machine truly "has everything."

AXELSON MANUFACTURING COMPANY

6160 S. Boyle Ave. (Box 98, Vernon Station) Los Angeles 11, California • 50 Church Street, New York City 7, N. Y. • 3844 Walsh Street, St. Louis, Mo.

AXELSON

THERE IS NO ECONOMICAL SUBSTITUTE FOR QUALITY

Lathes

DEPENDABLE FOR OVER A QUARTER CENTURY

SPECIFY *Van Keuren* WIRE TYPE PLUG GAGES

Tool Steel
High Speed Steel
Chromium Plated
Carboloy

Wire Type Plug Gage Set No. 60 This set of gages provides accurate standards for checking twist drills in sizes from 1 to 60 (.228" to .040" diameter.) A useful set of standard size gages. Price $375.00

Van Keuren Wire Type Plug Gages Set No. 80 which includes drill sizes from No. 1 to 80 (.228" to .0135.) Price $425.00

SET NO. 80

Wire Type Plug Gages were originated by the Van Keuren Co. in 1925. They are now in almost universal use for gaging small holes.

Long lasting precision and lower gauge cost are assured because the entire 2" length of the gaging unit can be used. When the end becomes worn, it is ground off and a new section of the original accuracy is moved out for use. The wire unit is securely held in the handle by a split bushing and a headless set screw.

Van Keuren Wire Type Gages are made to Class B accuracy +.00005" −.00000" on the Go units and ±.000025" on the No Go units. Closer or wider tolerances can be supplied if desired.

On your next order specify VK Wire Type Plug Gages. VK Carboloy for long runs because of the enormous saving in gage cost. VK Carboloy for fussy jobs because of the infinitesimal gage wear and insurance that the parts will be within the specified limits. VK Tool Steel—High Speed—Precision Chromium for less exacting jobs. You will be assured of the best in accuracy, quality and delivery.

The 160-page Van Keuren Catalog No. 33 gives full information on wire type plug gages and other precision measuring equipment. It also includes simplified formulas for measuring threads, splines, gears and worms. Your copy of this valuable handbook will be sent on request.

Van Keuren CO.,

176 WALTHAM STREET, WATERTOWN, MASS.

28th YEAR

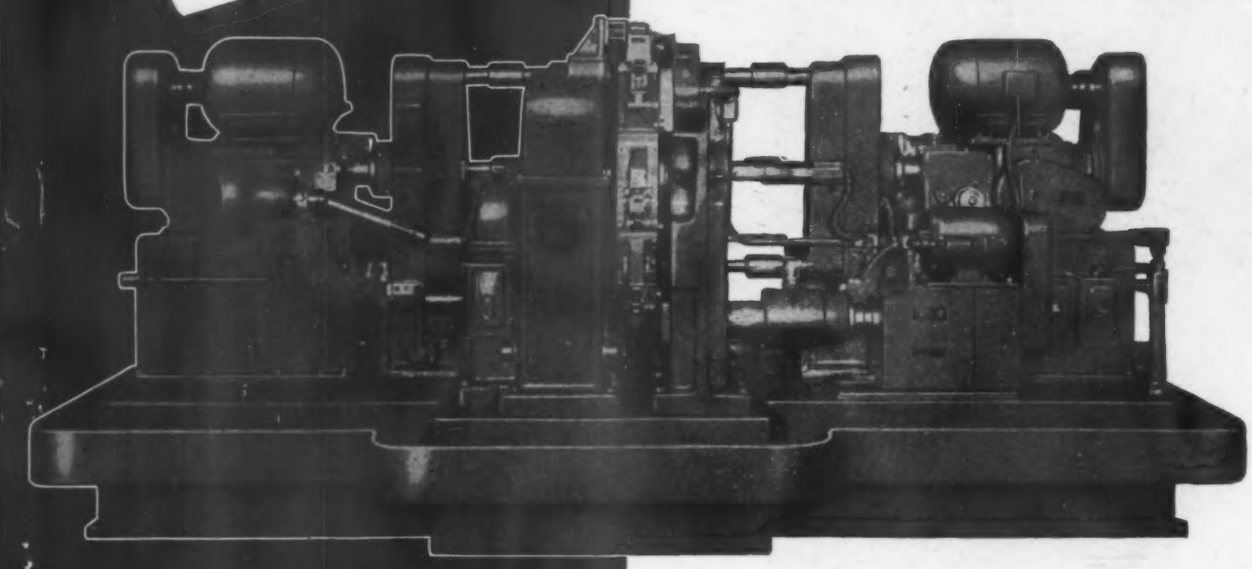
Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Plug Gages • Carboloy Measuring Wires.

Avey Automatic METHOD No. 5

THE Avey CAM FEED UNIT

No. 1 Size—1/2" capacity in cast iron.

No. 2 Size—7/8" capacity in cast iron.



Accelerated production obtainable by free loading time and automatic ejection of work. Fatigue element lessened by automatic indexing.

METHOD No. 5 — lower cost per part, completed double end work at one clamping — (no relocation) — greater accuracy, enabling semi-skilled operators to deliver high quality production speedily, accurately, efficiently, with a minimum of supervision.

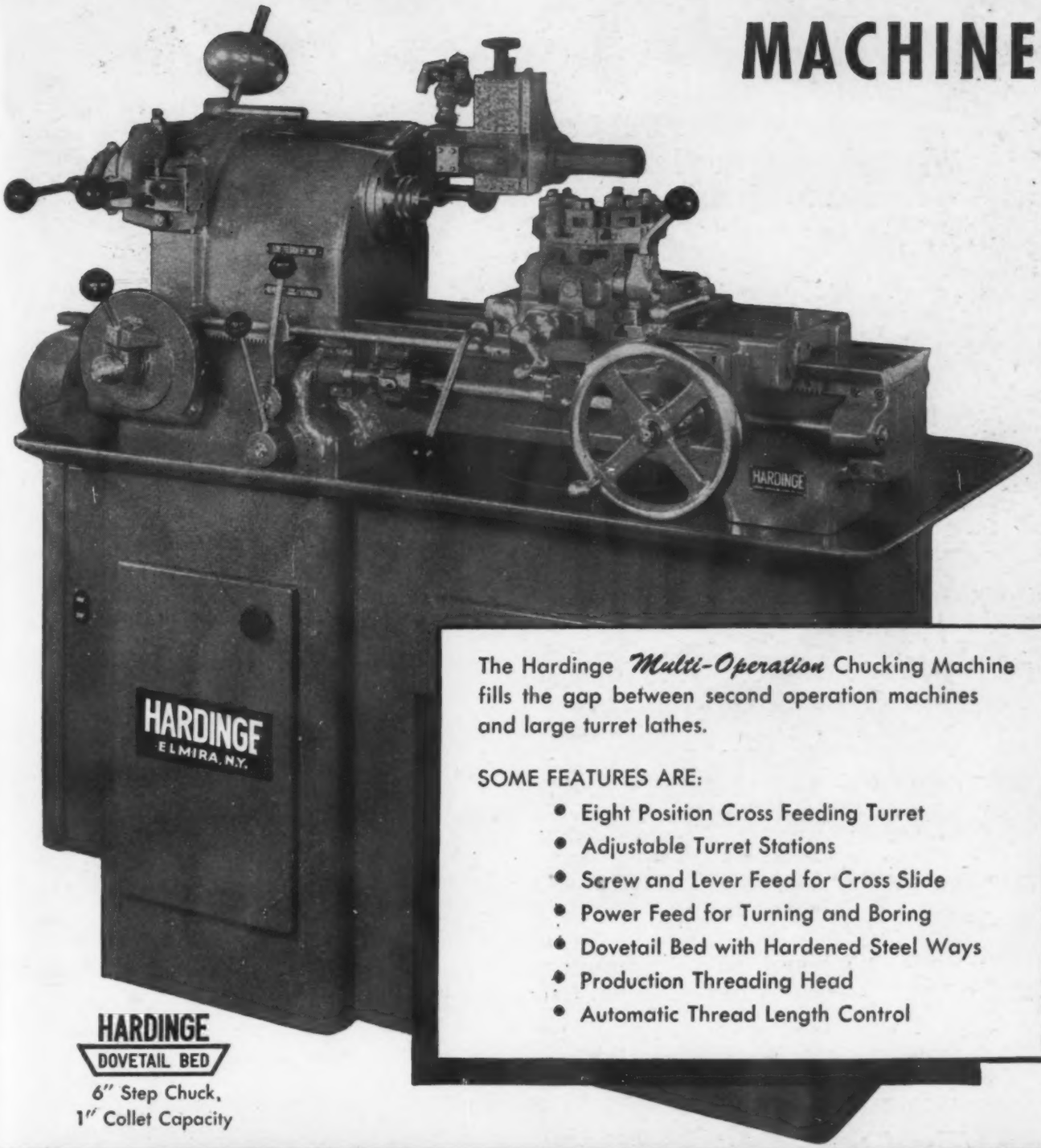
designed for multiple operations on individual parts—(double end at one clamping of work) — facing, drilling, reaming and tapping.

Send for Engineering Bulletin 645

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.

HARDINGE
ELMIRA, N.Y.

announces a NEW CHUCKING MACHINE



HARDINGE
DOVETAIL BED
6" Step Chuck,
1" Collet Capacity

The Hardinge *Multi-Operation* Chucking Machine fills the gap between second operation machines and large turret lathes.

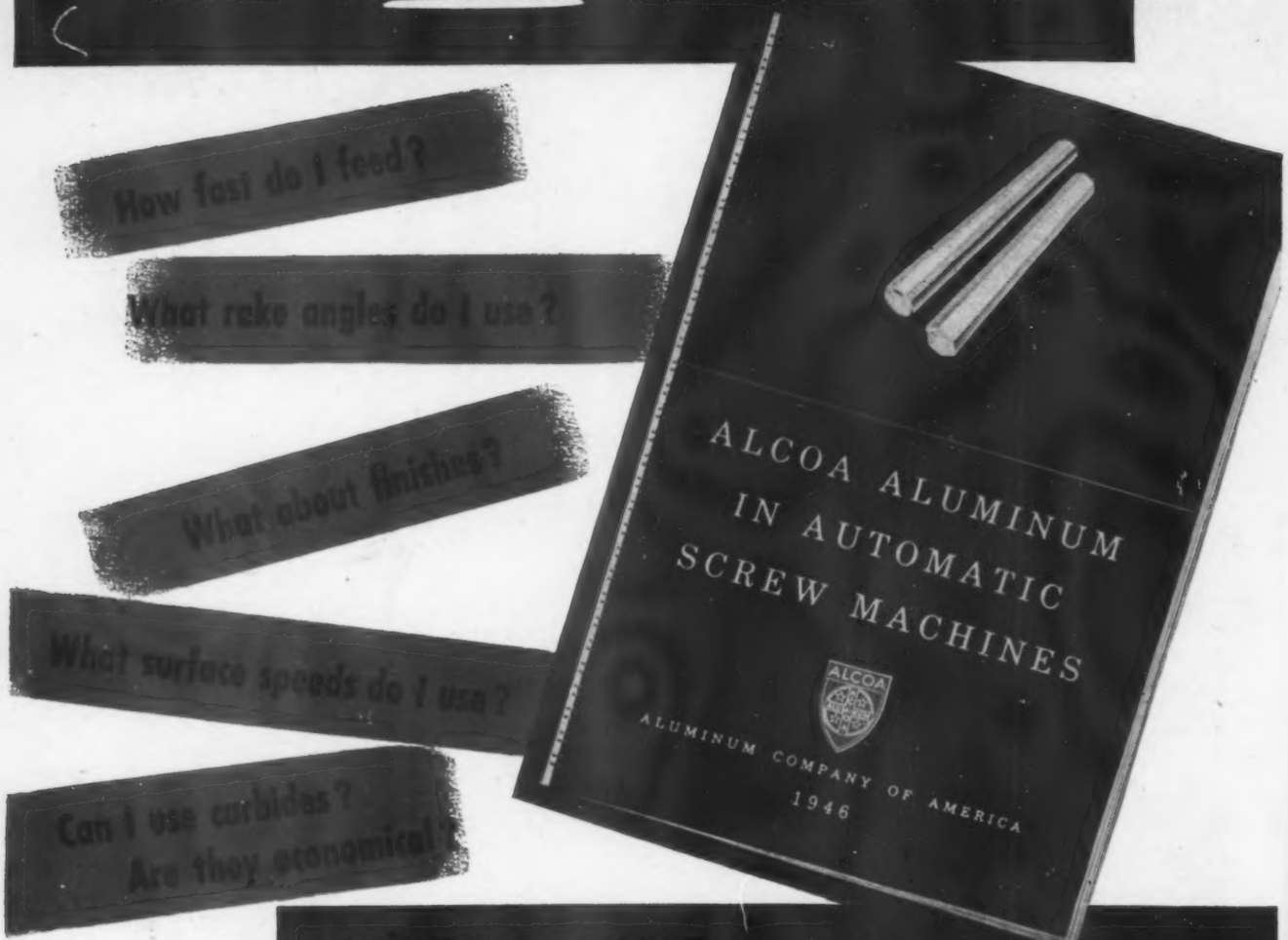
SOME FEATURES ARE:

- Eight Position Cross Feeding Turret
- Adjustable Turret Stations
- Screw and Lever Feed for Cross Slide
- Power Feed for Turning and Boring
- Dovetail Bed with Hardened Steel Ways
- Production Threading Head
- Automatic Thread Length Control

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

WHAT'S YOUR QUESTION?....



YOU'LL FIND ALL THE ANSWERS IN THIS BOOKLET

ALUMINUM COMPANY OF AMERICA
2107 Gulf Bldg., Pittsburgh 19, Penna.
Sales Offices in leading cities

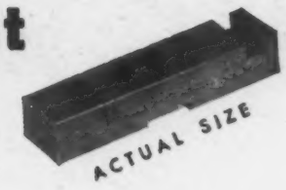
MORE people want MORE aluminum for MORE uses than ever

ALCOA ALUMINUM

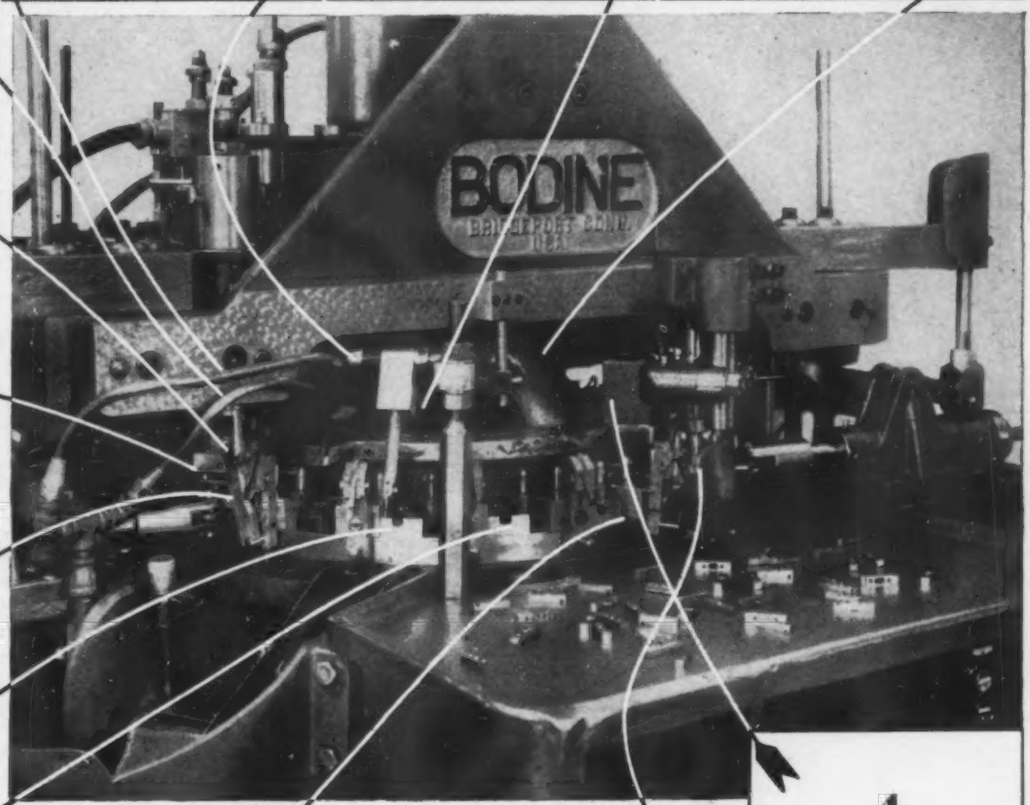
IN EVERY COMMERCIAL FORM

Bodine..CASE HISTORY No. 18

Processing a Steel Component



PRODUCTION: There are 9 operations automatically performed on this Steel Component, size .229 thick x .289 wide x 1.280 long. Speed: 600 pieces per 50 minute hour.



8 QUALIFY ONE .161/.121 HOLE FOR .002 DEPTH C' BORE

7 QUALIFY ONE .161/.121 HOLE FOR .002 DEPTH C' BORE

6 DRILL ONE #32 HOLE .030 THRU

5 DRILL ONE #32 HOLE .030 THRU.

9 DRILL 7/32 HOLE .229 THRU

10 DRILL 7/32 HOLE .229 THRU

11 DRILL 7/32 HOLE .229 THRU TO COMPLETE ELONGATED CLEARANCE SLOT 7/32 x .344 LONG.

12 AUTO — UNCLAMP FIXTURE

13 AUTO — EJECT

1 LOAD

2 AUTO — CLAMP PART IN FIXTURE

3 DRILL ONE 5/32 DIA. HOLE .204 DEEP

4 DRILL ONE 5/32 DIA. HOLE .204 deep

THE **Bodine** CORPORATION

BRIDGEPORT 5, CONNECTICUT

AUTOMATIC DIAL TYPE DRILLING, MILLING TAPPING, AND SCREW INSERTING MACHINES

"with GULF L. S. CUTTING BASE

we doubled tap life, reduced breakage, and improved thread finish"

says this Lubrication Supervisor

The Lubrication Supervisor consults with a Gulf Lubrication Engineer (left) on results with Gulf L. S. Cutting Base A in tapping cold rolled iron magnet yokes for business machines.

"WE make careful performance studies to insure that the cutting oil used for each particular job is the best we can select for that job," says this Lubrication Supervisor. "This policy has paid us big dividends in greater machining efficiency. When we switched to Gulf L.S. Cutting Base for tapping magnet yokes, for example, we increased tap life 100 per cent, reduced tap breakage, and improved thread finish."

Every Gulf Cutting Oil has specific properties which insure better performance on certain types of jobs! Call in a Gulf Lubrication Engineer today and let him show you how they can help you improve your machining practice. Write, wire, or phone your nearest Gulf office.

Gulf Quality Cutting Oils

Gulf Lasupar Cutting Oils A, B, and C
Gulf Electro Cutting Oils A, B, and C
Gulf M-L Cutting Oils A, B, and C
Gulf Cut-Aid
Gulf Cutx B
Gulf L. S. Cutting Base A and B
Gulf Soluble Cutting Oil A

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G-E ELECTRONIC HEATER STRAIGHTENS KINK IN MILK-CAN PRODUCTION LINE

THE JOB...

One of the operations in the manufacture of milk cans in the Buhl Manufacturing Company, Detroit, Mich., requires annealing milk-can necks for the purpose of forming rolled lips.

THE OLD METHOD...

The cans were removed from the production line and the entire upper portion of the milk can was furnace annealed—a step which required two men. Following this time-consuming operation, the cans were pickled to remove scale and returned to the production line for further processing.

THE NEW INDUCTION METHOD

A G-E 15-kw electronic induction heater with a two-position fixture was installed directly in the production line, where one man now performs the entire annealing process. At one position, approximately one inch of the neck is brought to annealing temperature in the short time of 12 seconds, while the second position is being unloaded. By means of a transfer switch, power is applied to the other station, which has been reloaded.

HERE'S WHAT INDUCTION HEATING HAS DONE FOR THIS COMPANY—

1. **Increased production**—by making manufacture a continuous process—cutting annealing time to seconds—eliminating pickling.
2. **Cut costs**—by requiring less time and labor per unit.
3. **Better product**—by localizing annealing to the neck, giving the rest of the can greater resistance to denting or damage.

WHAT CAN ELECTRONIC INDUCTION HEATING DO FOR YOUR PRODUCT?

We would welcome the opportunity to give you an unbiased answer to this question. Simply get in touch with the Heating Specialist in the nearest G-E Office. In the meantime, send the coupon for our free bulletin GES-3290A, "The How and What of Electronic Induction Heating."

Apparatus Department, Sect., E675-152
General Electric Company
Schenectady 5, N. Y.

Please send me your free bulletin GES-3290A, "The How and What of Electronic Induction Heating."

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GENERAL ELECTRIC

HERE'S YOUR LIBRARY OF *Gage Facts*

A Air-O-Limit Comparators

B Electrolimit External Comparators

C Electrolimit Internal Comparators

D Electrolimit Snap Gage

E Precision Gage Blocks

F Standard Measuring Machine

G Super-micrometer

H Multiple Electric Contact Gages

I Electrolimit Height Gage

J Electrolimit Mill Gages

Order one book or all . . . according to your needs

Today's competitive production demands the best gaging practice. Accuracy must be controlled *before* errors pile up expensive rejects. That means precision gaging at every step of production. And P&W engineering brings you the correct gages for every need.

Statistical Quality Control is a new production system that calls for the best available comparators. The first four catalogues illustrated above tell you about the P&W Electrolimit and Air-O-Limit Comparators that are fitting into Quality Control setups, everywhere.

Select the catalogues you need. Order one, two, or all. They're all free. Just drop us a line on your letterhead and give us the designating letters. You'll get prompt action.

ALSO

K Measuring Instruments*

L Roll Thread Snap Gages

M Adjustable Limit Snap Gages

N Cylindrical Gages

O Thread Gages

P Precision Levels

Q ANPT Pipe Thread Gages

R Railroad Gages

S Oil Country Gages

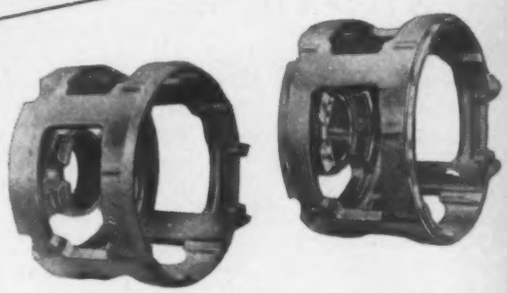
**For the man responsible for a Standards Room, small or large, this book is a "must".*

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

Automatic Feed Changing provides speed and accuracy on the FASTERMATIC



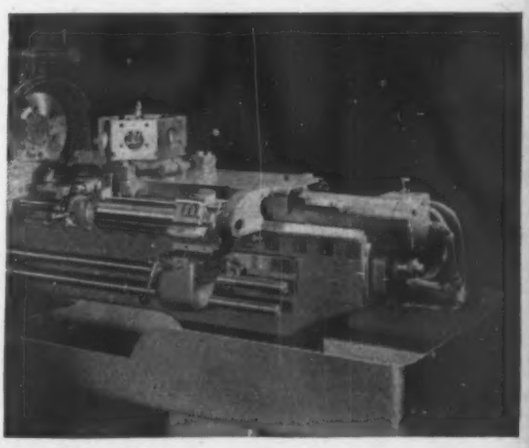
Generator frame before and after machining.

Suppose you have a job like this—a fragile generator frame requiring the accurate machining of six different surfaces in one operation at four different feeds, each most suitable for the specific cut. Here's another case where you can use the versatile Fastermatic to real advantage.

The operator merely loads the machine—quickly and easily—using spring clamps instead of a chuck to avoid distortion. The Fastermatic does the rest, making the cuts and changing four feeds—*automatically.*

It bores one hole to a tolerance of .0003" and holds all other required dimensions—thanks to proper cutting speeds and feeds. And it does the entire job in only 4½ minutes.

Whether your problem is a delicate part like this, or a rugged forging, you'll find the Fastermatic has the ability to do the job—faster, at lower cost. Write for complete information.



This cam drum on the hexagon turret carriage controls the feed for all operations automatically. Adjustment is fast and simple.

GISHOLT MACHINE COMPANY
1245 E. Washington Ave. • Madison 3, Wis.
Look Ahead...Keep Ahead...with Gisholt

GISHOLT

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

The NEW CLEVELAND

TWO POINT
DOUBLE ACTION
TOGGLE PRESS

DESIGNED along the same general lines as our standard Single Point, Two Point and Four Point Single Action Presses, this Modern Cleveland Two Point—*Double Action* Toggle Press is arranged with the gears and drive unit enclosed in the box type crown and is equipped with an electrically controlled air operated friction clutch and brake. The gears run in a bath of oil.

Both the inner, or forming slide; and the outer, or blankholder slide, are designed with extremely long bearing surfaces, so as to provide ample bearing surface even when the slides are at the extreme end of their stroke. The blankholder slide is counterbalanced by air, the cylinders being enclosed in the uprights.

While the following specifications apply to the Press illustrated, this type of Press can be furnished in sizes and capacities to meet particular requirements.

Stroke of inner slide 28".
Adjustment of blankholder 6".
Area of inner slide 89" x 40".
Capacity of inner slide 500 tons.
Stroke of blankholder 26".
Adjustment of inner slide 6".
Area of blankholder 101" x 60".
Capacity of blankholder 300 tons.

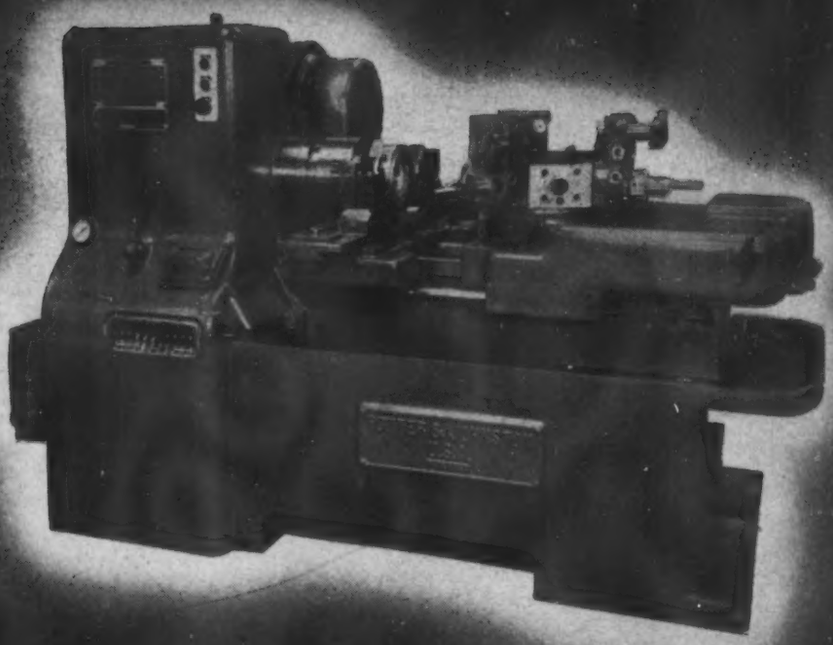
MODERN *Presses*

THE CLEVELAND PUNCH & SHEAR WORKS CO.
Cleveland 14, Ohio
New York · Chicago · Detroit · Philadelphia · Pittsburgh

P & J

4D
4DE
5D
5DE
5DL
5DEL
5D²9"
5D²12"
5D²15"
6DRE
6DREL
6DRELX
6DS
6DSE
8DT
8DXT
9D

and



NOW the NEW 3·U SPEED-FLEX

Head End View

Turret End View

an example of P&J's continued pioneering in the design and development of

AUTOMATIC TURRET LATHES

Among the features of this fast machine for machining small work, which make possible exceptionally high output per spindle, is Electro-Pneumatic Control of Speed and Feed Changes and Rapid Traverse.

The following are some of the outstanding advantages achieved:

. . . Split Second Timing . . . change from rapid traverse to feed, or vice versa, accomplished in 1/5th second.

. . . Turret Slide can drop from rapid traverse into feed for ¼" travel and return to rapid traverse in 2 seconds under set up conditions of top speed and 10 thousandths feed per R.P.M.

. . . Rapid Traverse Movement of turret slide and cross slides for one complete cycle of machine accomplished in 24 seconds.

Other features contributing to maximum performance as well as convenience, accuracy and economy are:

. . . rigidly constructed turret slide, with turret clamped in position after indexing. Turret indexed by means of a Geneva motion.

. . . turret location maintained in alignment with spindle by action of a locking and binding wedge.

. . . safety cut out switch in case of air failure.

. . . automatic stop at completion of work cycle.

. . . full electrical controls.

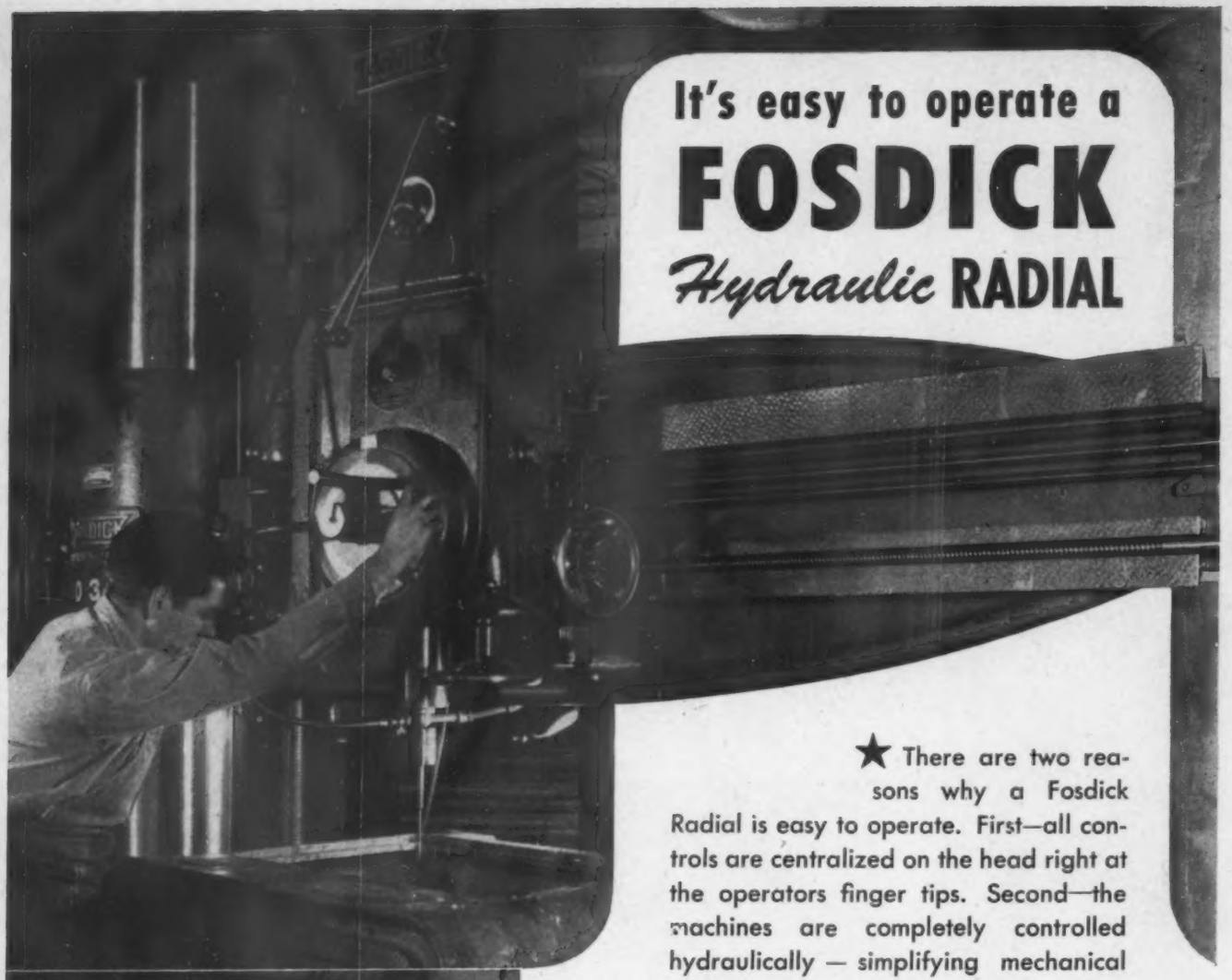
The new P&J 3U Speed-Flex Automatic Turret Lathe will machine small castings or forgings up to 6" diameter and 4" long.

Further details are available on request.

TTER & JOHNSTON MACHINE CO.,

Pioneer Manufacturer of Automatic Turret Lathes

PAWTUCKET, R. I.



It's easy to operate a FOSDICK *Hydraulic* RADIAL

★ There are two reasons why a Fosdick Radial is easy to operate. First—all controls are centralized on the head right at the operators finger tips. Second—the machines are completely controlled hydraulically — simplifying mechanical mechanism and providing ease of movement.

For example—the operator can rapid traverse the head hydraulically by the mere flip of a lever in direction he wants head to move. With practically no effort he can locate drill for next operation.

The hydraulic column clamp is simple and foolproof. The interlocking lever for unclamping, raising and lowering the arm, eliminates use of two levers and possibility of operator forgetting to clamp the arm when drilling.

All of which adds up to faster operation—less time consumed between operations—and lower cost per hole on a wide range of drilling—reaming and tapping operations.

Full details of construction and design are contained in Fosdick Radial Drill Folder R.D.A. Write for yours today.

THE *Fosdick* MACHINE TOOL COMPANY
CINCINNATI 23, OHIO

"Veeder-Readings"

ARE DIRECT READINGS

...THAT MINIMIZE CONVERSIONS, ERRORS, DELAYS

Here's a new idea that's catching on among users (*and builders*) of machine tools:

Put an end to the setting and reading of hairline-graduated dials on all types of machines.

Install a Veeder-Root Counting Device that will give direct and accurate *Count*rol over rate of feed, depth of cut, or any other phase of operation.

Then operators and inspectors get their Facts-in-Figures directly, plainly, *unmistakably* . . . in bold, easy-to-read figures that don't have to be converted, decoded, or otherwise translated.

Veeder-Root engineers will show you how frontline machine-tool builders are *now* using built-in Veeder-Root *Count*rol to save time and trouble for their customers and for themselves.

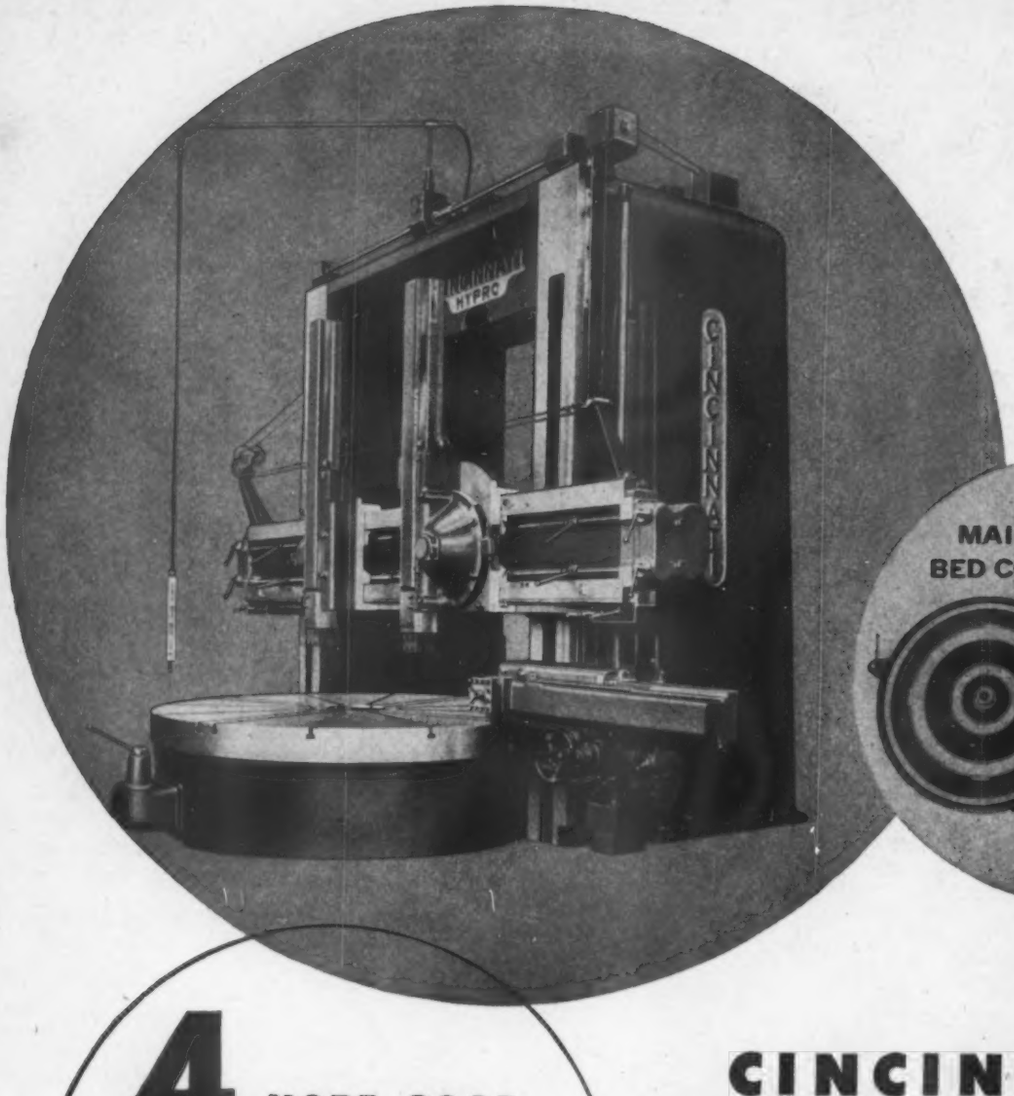
Just write and say when you would like to have a look at these interesting case-histories.

The Counting House of Industry

VEEDER-ROOT INC.

Hartford 2, Connecticut

In Canada: Veeder-Root of Canada, Ltd., 955 St. James St., Montreal 3. *In England:* Veeder-Root Ltd., Dickinson Works, 20 Purley Way, Croydon, Surrey.



4 MORE GOOD REASONS FOR THEIR AMAZING PERFORMANCE

CINCINNATI HYPRO Boring Mill

10-FOOT — 12-FOOT

1. One piece speed box and bed construction, providing rigidity and preventing misalignment of shafts
2. Hardened steel forged gears mounted on multiple splined shafts running in anti-friction bearings
3. Anti-friction bearing table mounting with 3 load carrying tracks; outside track nearly full diameter of table
4. Automatic pressure lubrication to all units and parts, interlocked with main drive motor

THE CINCINNATI HYPRO PLANER COMPANY

PLANERS · BORING MILLS · PLANER TYPE MILLERS

CINCINNATI, OHIO

IF IT'S A L-O-N-G HARD PULL-

Use B-C *Carbide Tipped Milling Cutters*

TOOL LIFE INCREASED FROM 30 TO 200 PIECES PER SHARPENING

●This solid, continuous cut in cast-iron, straight across a flat surface, is an ideal operation for B-C Carbide-Tipped Shell End Mills. Cutting Teeth, constantly engaged in the cut, need diamond-hard, sharp cutting edges to keep pace with production requirements. Constant contact with the material and the abrasive action formerly made frequent sharpening necessary with High Speed Cutters.

With B-C Carbide Shell End Mills, now used on the job, tool life is increased from 30 to 200 pieces per cutter sharpening, and production is increased 2 to 3 times over what was formerly obtained with HSS cutters.

Perhaps there are ideal conditions for carbide milling operations in your production lines. Carbide cutters cannot be expected to show improved results on all milling jobs, but under certain conditions they show definitely superior production advantages. Why not send us specifications on one of your jobs, and let us recommend and quote the proper carbide cutters for your consideration. Call your nearest Barber-Colman representative today.

CUTTER PERFORMANCE FACTS

Operation — Face mill four sides of machine table, each surface 2″ wide x 27″ long.

Material — Cast-iron.

Cutters — B-C Carbide Tipped Shell End Mills.

	HSS Cutter	C-T Cutter
Feed	3″ per min.	8½″ per min.
Speed	45 S.F.M.	210 S.F.M.
Cutting Time	80 sides in 10 hours.	140 sides in 10 hours.
Tool Life	30 pieces per sharp.	200 pieces per sharp.

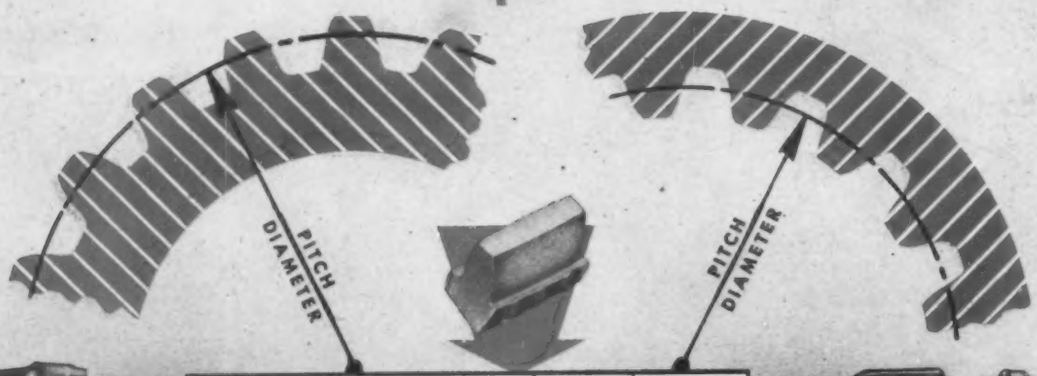
TROUBLE SHOOTING? Tool Supervisors:— Production Superintendents:— If you are having difficulty smoothing out certain milling operations, get a copy of MILLING CUTTER DATA. Descriptions of actual field installations using B-C Milling Cutters will suggest feeds, speeds, tooling arrangements and efficient methods for a variety of cuts. A note on your company letterhead will bring a copy promptly.

MODERN MACHINES WITH ORDINARY BARBER B-C COLMAN CUTTING TOOLS ARE NOT FULLY EFFICIENT

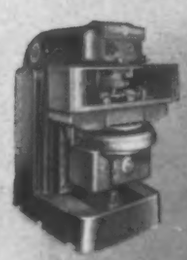
Barber-Colman Company

GENERAL OFFICES AND PLANT 111 LOOMIS ST. ROCKFORD, ILLINOIS U.S.A.

SPUR AND HELICAL GEARS ARE SHAVED AND CROWNED ON THESE RED RING MACHINES



Red Ring Machine Designation	External Gears Pitch Dia.	Teeth May Be Crowned	Internal Gears Pitch Dia.
GCL-3″	3/16″— 4″		
GCI-8″	1″— 8″	Yes	3″— 8″
GCI-12″	1″— 12″	Yes	3″—12″
GCI-18″	2¼″— 18″	Yes	3″—18″
GCP-24″	3″— 24″	Yes	
GCU-8″ Diagonal	1″— 8″	Yes	
GCU-12″ Diagonal	1″— 12″	Yes	
GCR-12″			3″—12″
GCJ-36″	4″— 36″	Yes	
GCM-36″	4″— 36″		
GCQ-36″ Standard	12″— 36″		12″—36″
GCQ-36″ Spec. Small	5″— 30″		5″—30″
GCQ-48″	22″— 48″		22″—48″
GCM-48″	4″— 48″		
GCK-96″	24″— 96″		
GCK-120″	48″—120″		


Model "GCU" Diagonal

Model "GCR" Internal

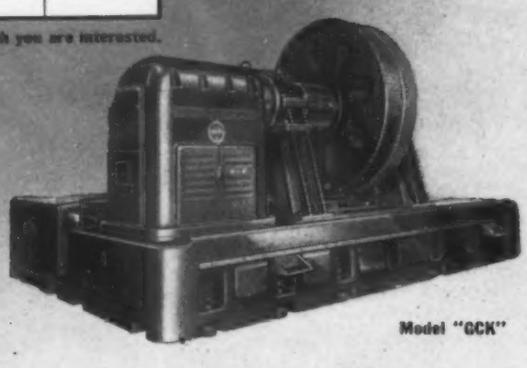
Model "GCL" Fine Pitch

Model "GCQ"

Write for descriptive folder on the machine in which you are interested.

Model "GCJ" and "GCM"

Model "GCI" and "GCP"


Model "GCK"

RED RING PRODUCTS

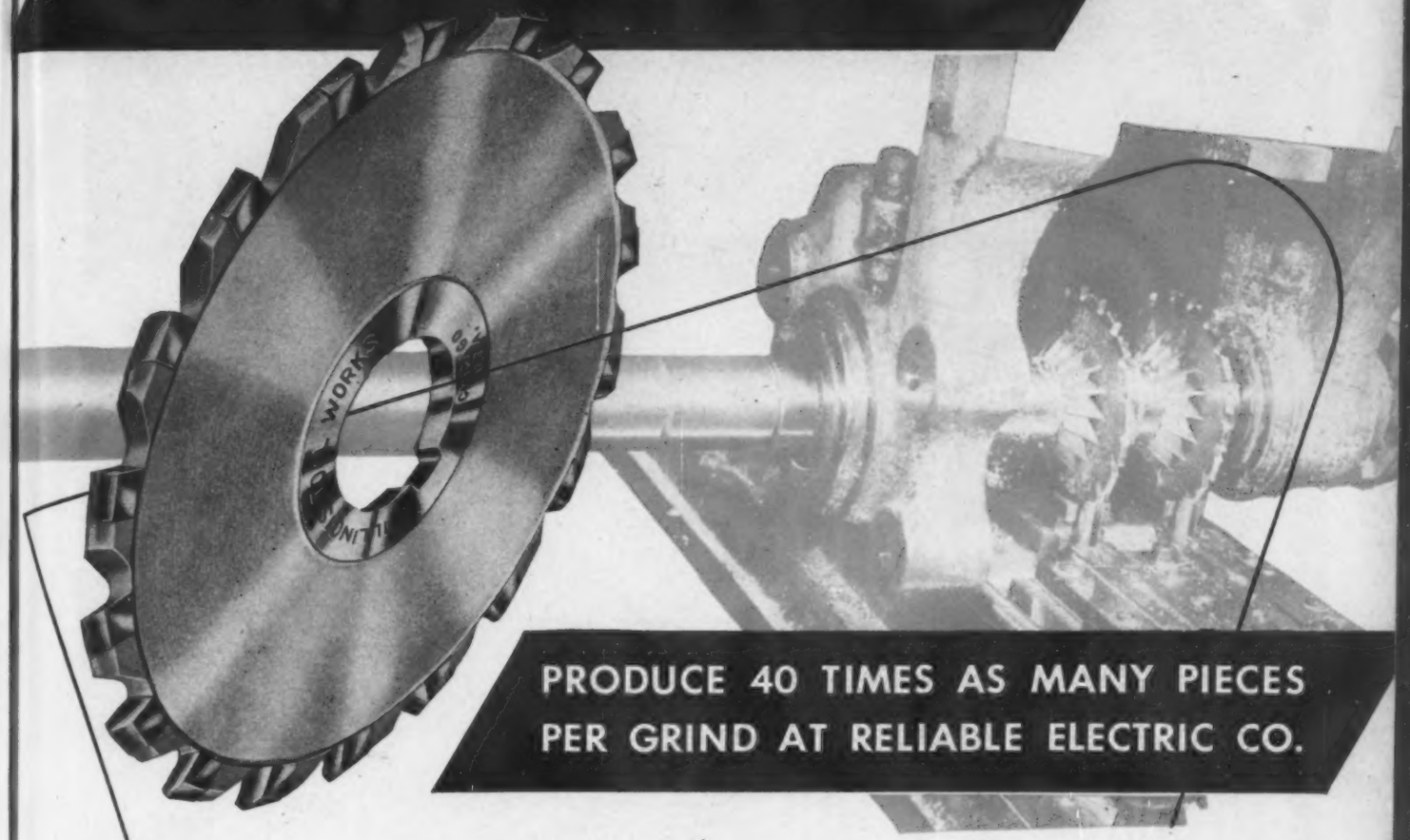
NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN • DETROIT 13, MICHIGAN

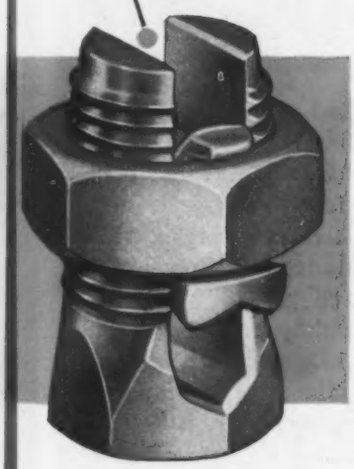
SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE • ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

2526

CARBIDE TIPPED CUTTERS



PRODUCE 40 TIMES AS MANY PIECES PER GRIND AT RELIABLE ELECTRIC CO.



Another sound application for carbide and another fine example of how Illinois Tool engineers, through their long experience with tools and tool materials of all types, can help you achieve peak production efficiency

Solving vital tooling problems like this is typical of the engineering cooperation and service that Illinois Tool offers you. Whatever your problem may be . . . carbide, high speed steel, or cast alloy tooling . . . Illinois Tool places at your disposal impartial judgment combined with the skill, talents and facilities acquired in 34 years as headquarters for engineered cutting tools

HE PROBLEM:

ngineers of Reliable Electric Company, Chicago, sired to increase the efficiency of slotting leaded onze split bolt connectors. High speed steel milling tters already gave 30 hours service per grind and ol life had to be increased even more.

RECOMMENDATION:

Special carbide tipped milling cutters designed through the cooperation of Illinois Tool Works and Reliable Electric engineers.

RESULT:

Carbide tipped cutters gave 1200 hours of service before grinding was necessary and efficiency climbed to 85%.

ILLINOIS TOOL WORKS

2501 North Keeler Ave. • Chicago 39, Ill.

1 • SHORT RUN TURNING

MORE EXAMPLES OF
LOW-COST TURNING WITH

MULTIPLE TOOLING

plus

Automatic Cycling

ON

Sundstrand

AUTOMATIC LATHES

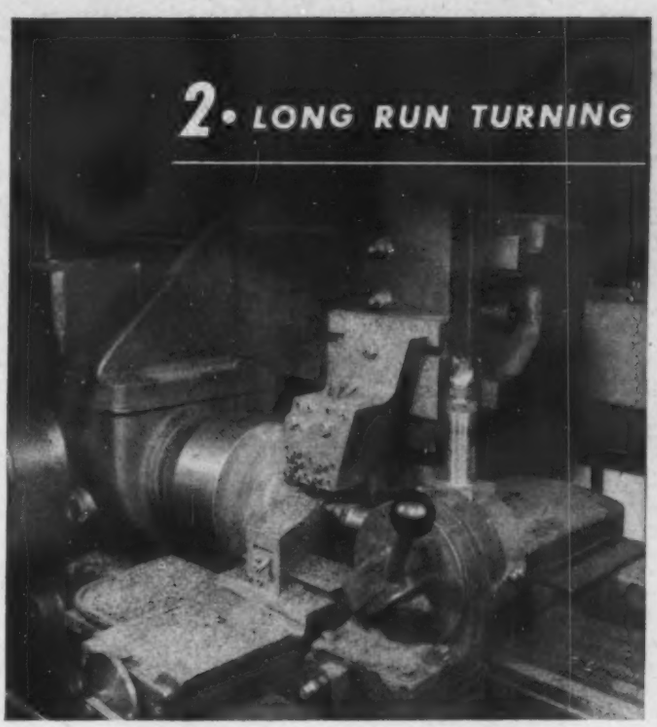
This Sundstrand Automatic Lathe handles 125 different sizes of gear blanks ranging in size from 1-7/16" O.D. x 5/8" wide to 8-3/16" O.D. to 2" wide. These were formerly machined from bar stock on a chucking machine and finished on an engine lathe. The Sundstrand lathe has reduced total machining time approximately 55% and greater accuracy is obtained. Two different tooling setups are used. The first rough turns the O.D., one face, chamfer and drills hole from solid. The second setup semi-finish turns O.D. one face and chamfer and finish bores and chamfers the hole.

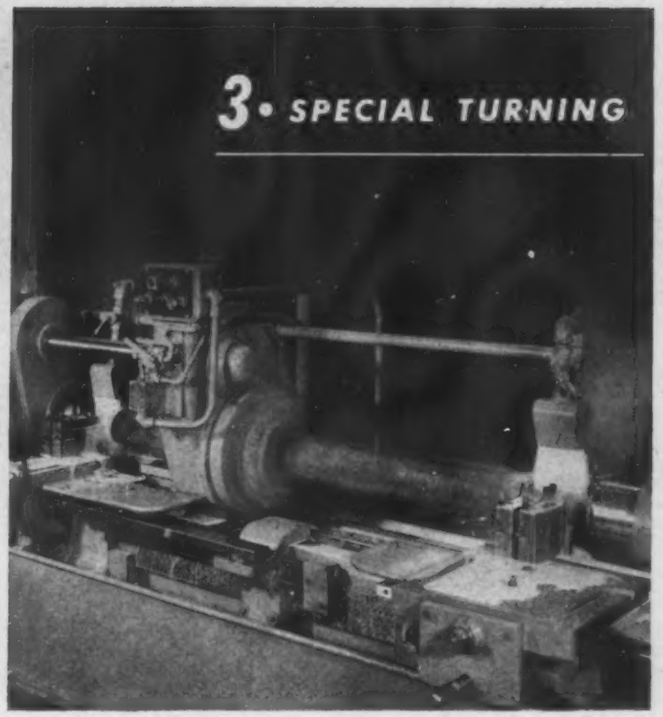
Whether your turning problem is a mass production job running into thousands of pieces . . . a short run of as few as 25 pieces . . . or a special turning job, Sundstrand engineers will show you how it can be handled to advantage on automatic lathes with quick cycle change-over. They will also assist in designing the most profitable processing method for the job at hand.

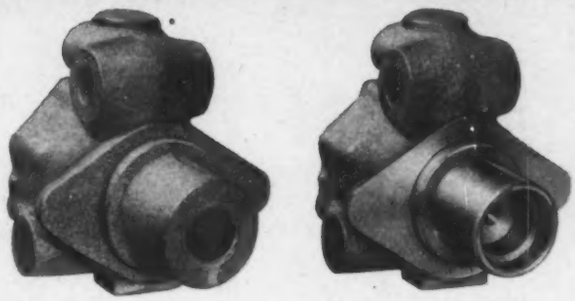
All of the advantages of multiple tool turning are available for both short run and mass production work with Sundstrand lathes. When the nature of the work is such that these standard automatic lathes cannot be tooled to handle the part, our engineers recommend and design special automatic lathes. Described here are three typical cases in which Sundstrand "Engineered" production assisted plant engineers in designing a tooling method which resulted in lower turning costs.

SUNDSTRAND MACHINE TOOL CO. · ROCKFORD, ILLINOIS, U.S.A. ·

RIGIDMILS • FLUID SCREW RIGIDMILS • AUTOMATIC LATHES • HYDRAULIC EQUIPMENT







Here's an excellent example of how Sundstrand Automatic Lathes can be multiple tooled to simplify processing and increase production over other turning equipment. This cast iron pump body part formerly required 3 operations to do the turning, boring, facing and drilling of the center hole at a rate of 9.7 minutes per part. Changing the job to Sundstrand Automatic Lathes with multiple tooling made it possible to do the same machining in 2 handlings of the part and reduced the time per part from 9.7 minutes to 5.9 minutes. In addition to this profitable increase, parts are consistently duplicated accurately and the operator's duties simplified due to the automatic machine cycle.

Here's a standard Model 10 lathe with a special bed for handling work up to 66" long between centers. Two longitudinal feeding front carriages and two cross feeding rear tool slides are used with a center drive unit so that both ends of the part can be machined simultaneously. Both front and rear slides are adjustable so that, with some additional tooling, approximately 12 different sizes of parts can be accommodated. Production with this lathe and tooling has been increased on an average of five times over the former method. Operations consist of turn, shoulder and chamfer both ends of brake beams.

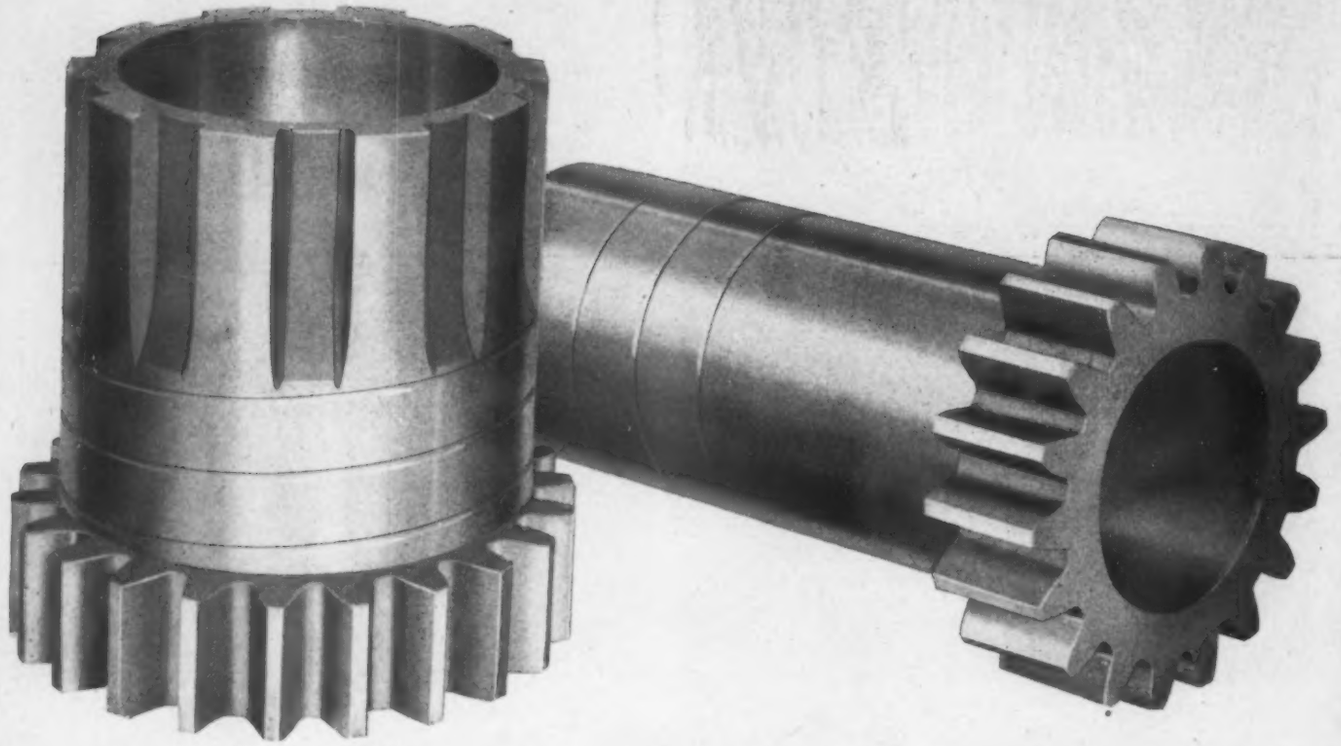
More FREE Turning Data

This free 44-page booklet contains helpful tips on processing turning jobs, together with illustrations and tooling diagrams. Complete engineering and production data are given on many jobs similar to yours. Write for your free copy today. Ask for bulletin 160.

SUNDSTRAND MACHINE TOOL COMPANY

2533 Eleventh St. • Rockford, Ill., U.S.A.

MILLING AND CENTERING MACHINES • SPECIAL MILLING AND TURNING MACHINES



Custom gears made *RIGHT*

can slash your assembly costs!

- Spur Gears
- Helical Gears
- Bevel and Miter Gears
- Worms and Worm Gears
- Internal Gears (spur and helical)
- Sprockets
- Ratchets
- Splined Shafts
- Racks
- Lead and Feed Screws
- Ground Tooth Gears (spur and helical)
- Shaved Tooth Gears (spur and helical)
- Ground Thread Worms

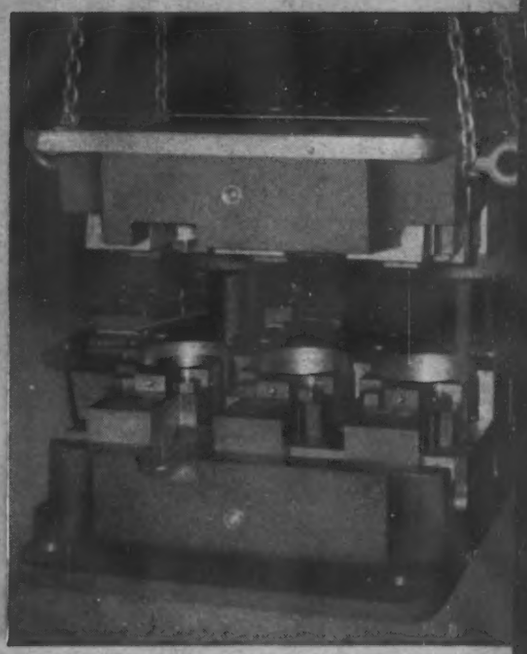
WHILE your product is still on the drawing board investigate the many advantages of gears made especially for your requirements. Designing the gears to fit the product rather than the other way around will frequently make it possible to simplify and speed-up assembly while providing better performance for the product. Regardless of the quantity or type of gears you'll need, why not talk it over with us. Our experienced gear specialists will be pleased to make recommendations. THE ADAMS COMPANY, 1942 Bridge St., Dubuque, Iowa.

the ADAMS compa
Dubuque, Iowa, U. S. A.

GEARS

FINE GEARS MADE TO YOUR SPECIFICATIONS . . . ESTABLISHED 1883

Now Danly Special Die Sets



with any additional machining required

New equipment installed in the Danly shop permits us to do any machine work on large or complex die sets incidental to the mounting of the dies. Inserts, recesses, additional boring, keyways and other machining can be done to the customer's specifications.

Time is saved by this service as work on dies and on the die set can be done at the same time. It permits the die shop or tool room to devote their equipment and man hours to the making of dies. The problem of the handling of big sets, for which the die shop or tool room are not generally equipped to do economically, is also solved by this service.

These special die sets are then delivered ready for the mounting of the dies. Note the size and complexity of the die set shown on this page. This die set—machined at Danly—is an example of the additional machining and service which this company offers.

On your next special die set inquiry include the additional machining work that you wish done at Danly while the die set is being made. The cost of this machining will be shown as a separate item in the quotation.

DANLY MACHINE SPECIALTIES, INC.

2100 South 52nd Avenue • *Chicago 50, Illinois*

Milwaukee 2 . . 111 East Wisconsin
Detroit 16 . . . . . 1549 Temple Avenue
Cleveland 14 . . 1550 East 33rd Street
Dayton 2 . . . . . 990 East Monument
Rochester 4 . . . 16 Commercial Street
Philadelphia 44 . . 18 W. Chelten Ave.
Long Island City 1 . 47-28 37th Street
Ducommun Metals & Supply Company
4890 South Alameda, Los Angeles 54

DANLY *Special* DIE SETS

MACHINED TO YOUR SPECIFICATIONS

FOR EVERY *Metal* AND EVERY *Plastic* ...THERE'S A CLE-FORGE SPECIAL PURPOSE DRILL

TRADE MARK REG. U.S. PAT. OFF.

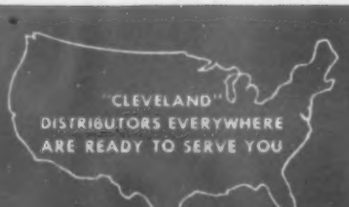
Over a period of years we have developed a wide range of CLE-FORGE High Speed Drills for special purposes . . . for aluminum, brass, magnesium, copper, die casting materials, plastics, wood, slate, marble, stainless steel . . . short length screw machine drills; drills for airplane body work, cotter pins, crankshafts, stove burners; step, bonding and oil hole drills—and others. The proper selection of these Special Purpose Drills will enable you to produce better work faster, at lower cost. Write for illustrated booklet, or

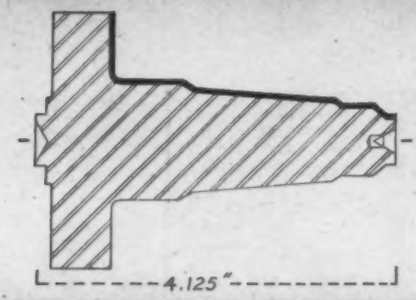
Telephone your I S D INDUSTRIAL SUPPLY DISTRIBUTOR

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49TH STREET
CLEVELAND 14

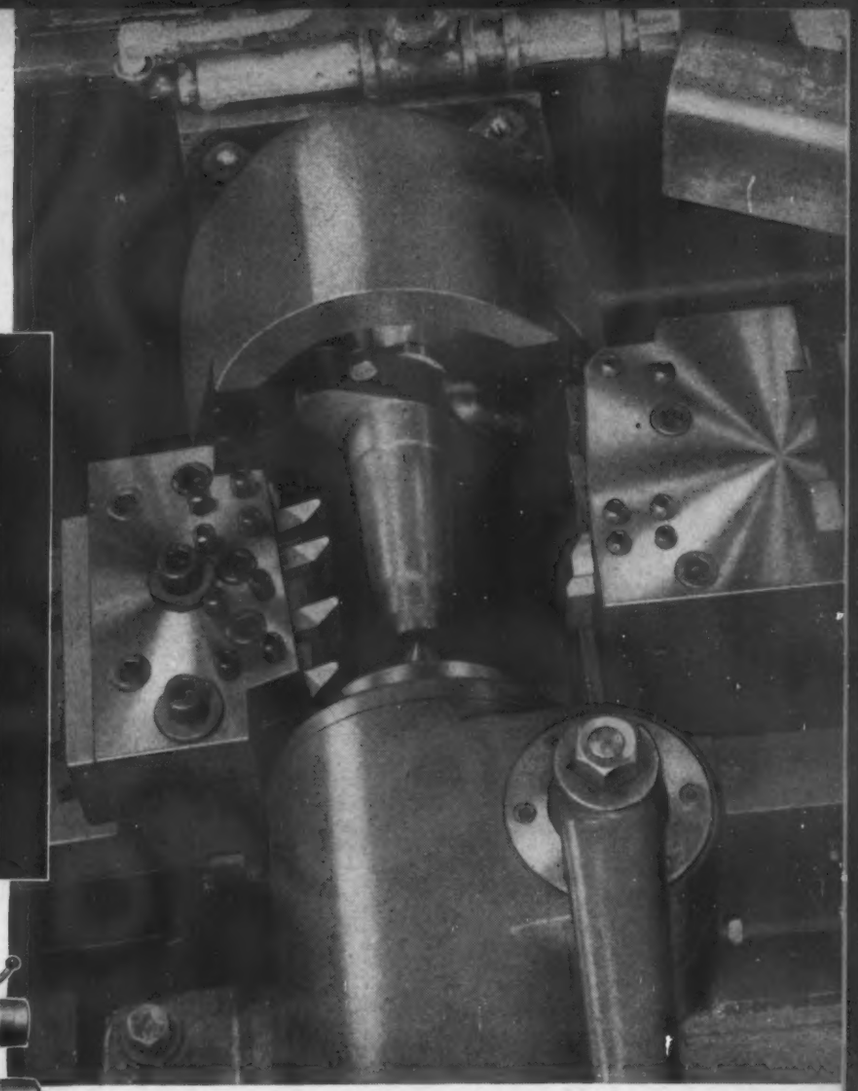
TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

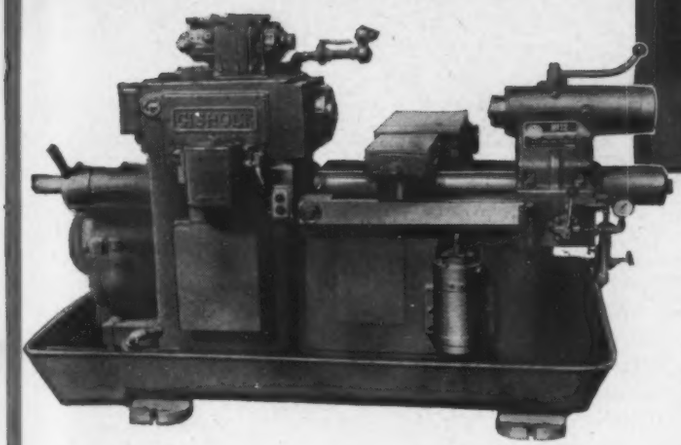
70 THOMAS ST., NEW YORK 7 • 9 NORTH JEFFERSON ST., CHICAGO 6 • 650 HOWARD ST., SAN FRANCISCO 5
2929 EAST GRAND BLVD., DETROIT 2 • 1902 NORTH FIELD ST., DALLAS 1
E. P. BARRUS, LTD., LONDON W. 3, ENGLAND





take a *Short Cut* on all cuts





with the GISHOLT *Hydraulic Automatic Lathe*

HERE'S a typical example of the ability of the Gisholt No. 12 Hydraulic Lathe to profitably combine a number of cuts in one operation.

In the machining of a type of Diesel Engine Injector Body (material—SAE 4150 steel forging, in lots of about 1000), *one* No. 12 operation is accomplishing the same work that formerly required two operations, one on each of two less versatile automatic lathes. And this work, which used to take about 5 minutes per piece to perform, is now completed in *1.5 minutes on the No. 12.*

Comparable savings are being realized on two other similar types of injector bodies, with rapid changeover, through the machining advantages of the Gisholt Hydraulic Lathe.

One reason so many jobs are done faster on the Gisholt No. 12 lies in the wide latitude of tooling arrangements it makes possible. Operations such as taper turning, forming, angular facing, constant speed radius cutting and intermittent facing can be efficiently combined with orthodox turning, facing, boring, and grooving.

Investigate the characteristics of this advanced automatic lathe that give it such remarkable earning power.

GISHOLT MACHINE COMPANY

Madison 3, Wisconsin

THE GISHOLT ROUND TABLE

represents the collective experience of specialists in the machining, surface finishing and balancing of round and semi-round parts. Your problems are welcome here.

TURRET LATHES · AUTOMATIC LATHES · SUPERFINISHERS · BALANCERS · SPECIAL MACHINES

THE KEY TO BETTER SMALL GEARS

Open the way toward getting UNIFORMITY in the Small Gears you buy! G.S. precision methods and machinery offer you the key to all that is newest and best in Fractional Horsepower Gear manufacture. Here, you'll get the friendly cooperation of *experts* . . men who have devoted a lifetime to the design and quantity production of *Small Gears exclusively.* Here, too, is every device known to modern science for producing gear after gear . . whether it's one hundred or one hundred THOUSAND . . to a degree of uniform accuracy heretofore considered impossible! If a Fractional Horsepower Gear is involved, by all means discuss its design and its function with a G.S. engineer. Get valuable information and cost estimates without cost or obligation. Discover for yourself why "G.S." has become the "WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS"!

SEND FOR . .

the G.S. 4-page Bulletin which illustrates and describes many different types and applications of G.S. Small Gears. Will you ask for a copy on company stationery, please?

GEAR Specialties

Spurs • Spirals • Helicals • Bevels • Internals • Worm Gearing • Racks • Thread Grinding

2635 WEST MEDILL AVENUE • CHICAGO 47, ILLINOIS

MEMBER OF AGMA

WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF FRACTIONAL HORSEPOWER GEARS

THIS IS DUPLITROL . . .

. . . FOR MAKING REPETITIVE PARTS *WITHOUT JIGS!*

2 ¾ x ¾ C.R.S. **BARS** *ONE* HORIZONTAL *ONE* VERTICAL . . . with ¼" holes machined at the desired spacing.

+ **2** HARDENED **PINS** . . . used to select locations according to the desired pattern of holes.

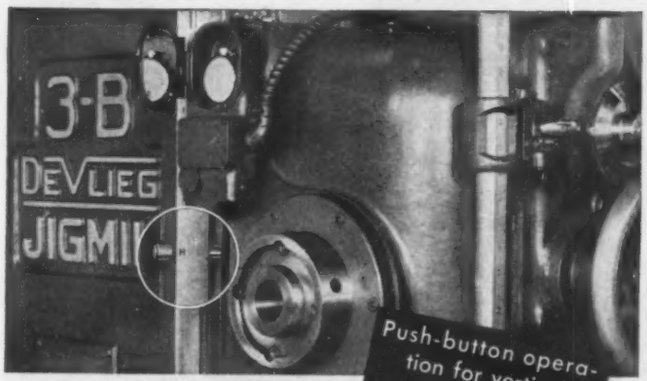
+ *Automatic* **POSITIONING** . . . accurately and dependably provides foolproof spacing for machining repetitive parts *without jigs.*

= DUPLITROL by DeVLIEG

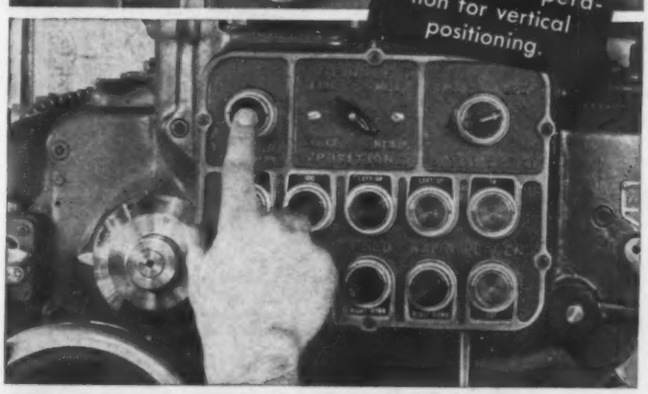
The finest known process for accurately spacing and machining holes.

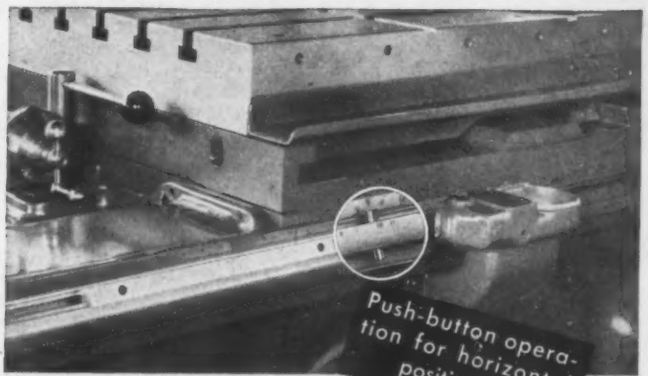
THIS IS HOW IT WORKS . . .

Illustrated at right is one vertical bar and one horizontal bar with pins used as masters on the 3B DeVlieg Duplitrol Equipped Jigmil. Below are illustrations showing how all spacing is done in response to push-button operation.

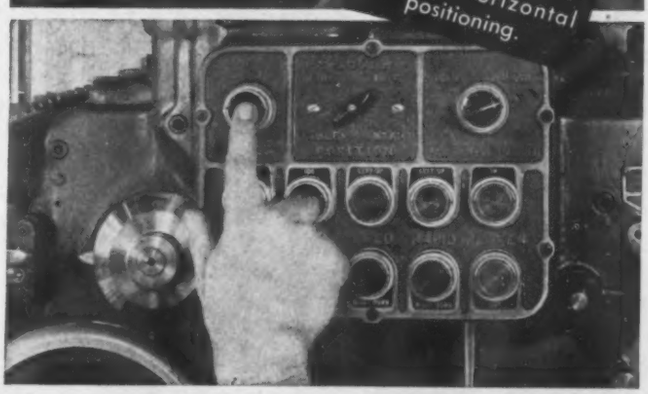


Push-button operation for vertical positioning.





Push-button operation for horizontal positioning.



DeVLIEG MACHINE COMPANY DEVLIEG JIGMIL **450 FAIR AVE. FERNDALE 20, (Detroit) MICH.**

LOCK JAW Stops

SLIDING

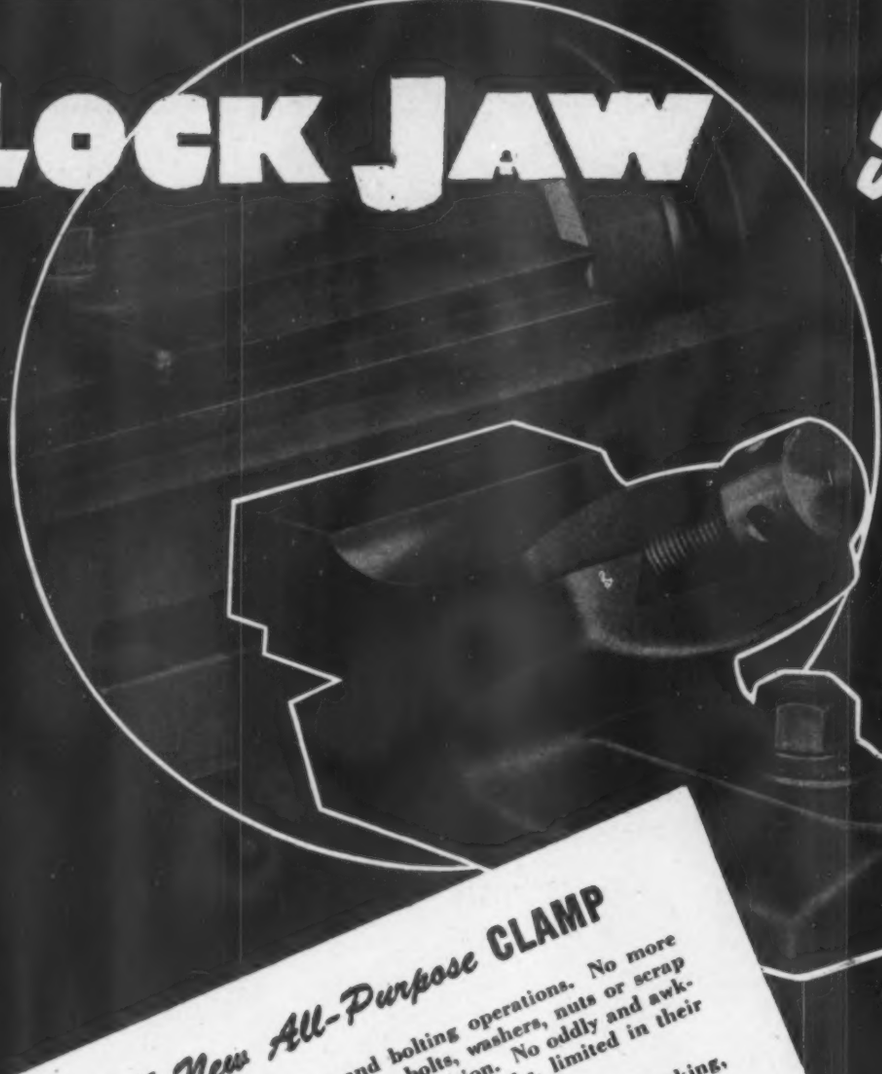
HEAVING

SHIMMYING

CHATTERING

YAWING

BUCKLING



HANDY *New All-Purpose* CLAMP

Eliminates expensive clamping and bolting operations. No more hunting around the shop for straps, bolts, washers, nuts or scrap pieces to wedge or lock your work in position. No oddly and awkwardly contrived, odd-sized and makeshift locks, limited in their ability to wedge and hold.

Now LOCKJAW gives you positive, powerful two-way locking, sure grip pressure downwards and side-ways. It may be set at any angle on the table and held by the T-slot bolt. Then LOCK-JAW pressure is applied to one or more pieces of stock by simply adjusting Capstan Jack Screw.

Setting up or taking down is a quick and simple operation. Every machine shop, tool room, or metal working unit can find many handy uses for this new Rivett conceived clamp on their planers, radial drills, shapers, milling machines, surface grinders and boring mills.

You, too, will save time, trouble and inconvenience when you use LOCKJAW to eliminate cumbersome and awkward clamping.

RIVETT

RIVETT LATHE & GRINDER, Inc.

BRIGHTON • BOSTON • MASS. • U. S. A.

Looking for Us, Chief?

Reproduced from an Old Engraving in Sears Pictorial Description of the United States Published 1848

1847 1947
A CENTURY OF SERVICE to Industry THAT MADE America Great

WE WERE HERE WHEN MILWAUKEE WAS SPELLED M-I-L-W-A-U-K-I-E!

MILWAUKIE, 1847 — A frontier settlement celebrates its first birthday . . . and a small factory turns out its first product—*millstones.*

One-hundred years later, in 1947, this progressive city salutes its oldest heavy machinery manufacturer—Allis-Chalmers . . . *one of the Big 3 in electric power equipment—biggest of all in range of industrial products!* Today, practically every U. S. manufactured product is aided in its course by Allis-Chalmers equipment.

In building a *better* millstone, crusher, turbine, motor—Allis-Chalmers has earned the respect and confidence of men in every industry.

We are proud to serve this basic pattern of American life: Power and Electrical — Mining and Rock Processing—Ferrous and Non-Ferrous Metal Producing — Metal Working — Food — Textile — Chemical — Petroleum — Wood — Rubber — General Manufacturing — Transportation — Construction — Public Works — Agriculture — National Defense. ALLIS-CHALMERS, MILWAUKEE 1, WISCONSIN.

ALLIS-CHALMERS

One of the Big 3 in Electric Power Equipment
Biggest of All in Range of Industrial Products

Power Generation . . .

Electrical Distribution . . .

. . . and Control Equipment

Texrope V-Belt Drives

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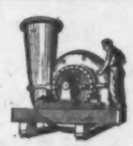

Blowers & Compressors

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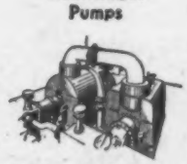
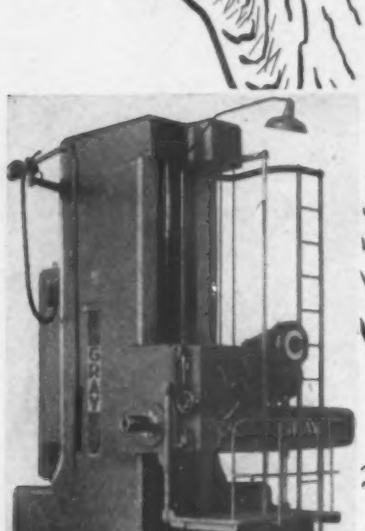


Marine & Defense Equipment

Farm & Industrial Tractors

A 2192

GRAY *Electrical Woodpecker**



You will agree "it's a bird" when you realize that it enables you to set the twenty-five ton column within a quarter of a thousandth of an inch by simply operating a jogging button.

This is one of the many exclusive features of Gray Boring, Drilling and Milling Machines.

Write for full illustrated descriptive Bulletin No. 48.

* *Protected by patent No. 2,354,413*

DOUBLE HOUSING and OPENSIDE PLANERS
•
SWITCH PLANERS
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DIE BLOCK PLANERS
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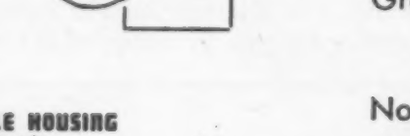
MILLING PLANERS
•
PLANER TYPE MILLING MACHINES
•
HORIZONTAL BORING MACHINES



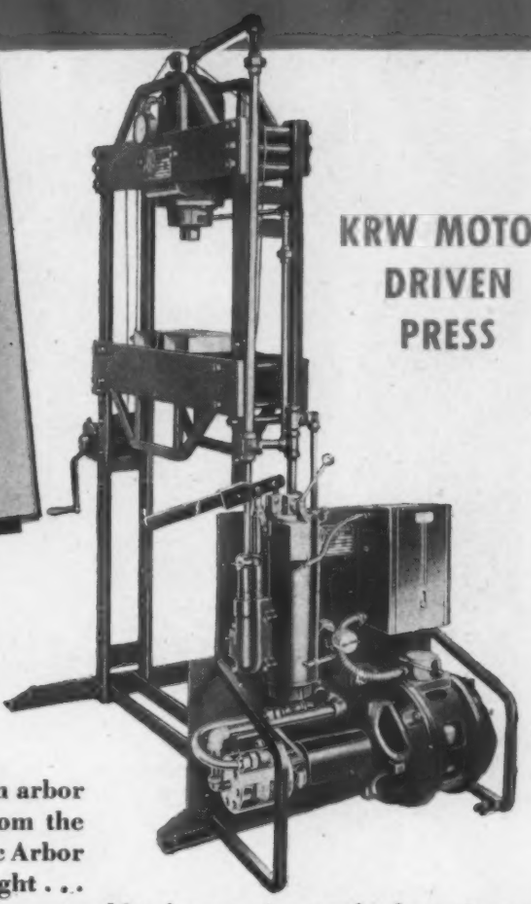
The G.A. GRAY Co.

CINCINNATI 7, OHIO, U.S.A.

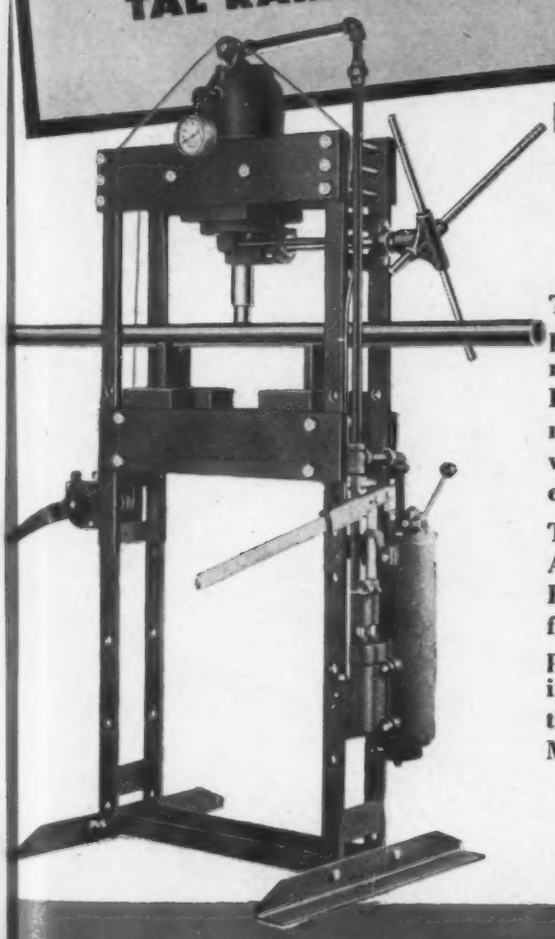
Sold in Canada by Upton, Bradeen and James Ltd. ● Sold in Latin America by Machine Affiliates.

Save time ON PRESSING, BENDING, STRAIGHTENING WITH A KRW HYDRAULIC ARBOR PRESS

INDISPENSABLE IN ANY SHOP ...HANDLES SHORT-RUN PRODUCTION WITH LOW-COST DIES ...AVAILABLE IN 25 TO 75-TON CAPACITIES, EITHER HAND-OPERATED OR MOTOR-DRIVEN, WITH VERTICAL OR HORIZONTAL RAM TRAVEL.



KRW MOTOR-DRIVEN PRESS



KRW HAND-OPERATED PRESS

The old conception of an arbor press is as different from the modern KRW Hydraulic Arbor Press as day is from night . . . now they are built in innumerable shapes, sizes and adaptations to work on hundreds of production jobs other than common straightening, bending and pressing work.

They are available as speedy Hand-Operated Presses; highly flexible Air-Operated Presses or as versatile and effortless Motor-Operated Presses. Then too, they are built in almost any conceivable physical form . . . tall, short, narrow, vertical or horizontal standing, as gap presses, forming brakes and many other designs. Mass production in a modern plant keeps KRW prices at rock bottom and quality at the highest possible peak. Write for the KRW illustrated Press Catalog. Mail the coupon for your copy now.

K. R. WILSON
215 MAIN ST., BUFFALO 3, N. Y.

K. R. WILSON, 215 MAIN ST., BUFFALO 3, N. Y.

Please send me information regarding 11

- KRW Hand-operated Presses ☐
- KRW Air-oil Operated Presses ☐
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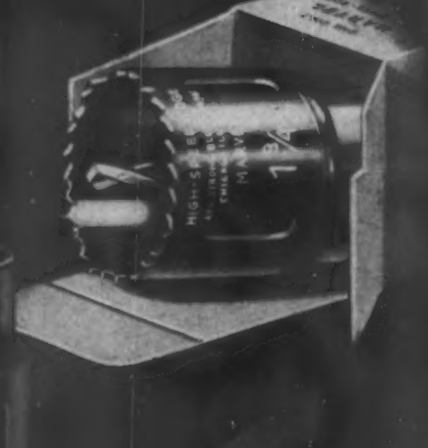
Metal Cutting

MARVEL SAWS

Better Machines–Better Blades



Regardless what type hack saw machines and metal-cutting band saw machines you use, **MARVEL BLADES** will improve performance. There are sound reasons why this is true; practical reasons that are easily understood and demonstrated.

MARVEL High-Speed-Edge Hack Saw Blades, with a genuine high-speed-steel cutting edge integrally welded to a tough alloy steel body, are both fast-cutting and *positively unbreakable*. This construction permits greatly increased speeds and feeds and tauter blade tensioning. Still, they last much longer than ordinary blades.

MARVEL High-Speed-Edge Hole Saws, with this same unbreakable construction and heavy-duty arbors, have the extra strength required for drill press and lathe use . . . rapidly saw holes from ⅝" to 4½" diameter thru steel of up to 1⅛" thickness.

MARVEL Band Saws are of selected quality. They come ready for use, pre-welded to size for each make and model saw. Individually boxed, they are protected against kinking, rusting or damage to teeth!

Write for Blade Catalog Sheet.

ARMSTRONG-BLUM MFG. CO.

5700 BLOOMINGDALE AVE. • CHICAGO 39, U. S. A.

WHY YOU CAN "CLEAN UP" FASTEST...

by

BLANCHARD

grinding:

PER-PIECE MILLING time: 12 min.

PER-PIECE BLANCHARD time: 3.6 min.

THE JOB... Cast iron work chain idler brackets—ground from rough casting to a commercial finish. Size of pieces: 16¾" x 6¾" x 4⅝"

These intricate pieces are held securely by simple support blocks on the 36-inch magnetic chuck of a No. 18 Blanchard Surface Grinder. Putting these pieces on the Blanchard eliminates the need for a special holding fixture. Thirteen pieces are placed on the chuck at each loading.

BLANCHARD GRINDING THESE PARTS REDUCED THE PER-PIECE MACHINING TIME TO 3/10 OF THAT NECESSARY WHEN A MILLER WAS USED

It will pay you to ask yourself—and us—on old and new work: "Can we put it on a Blanchard?"

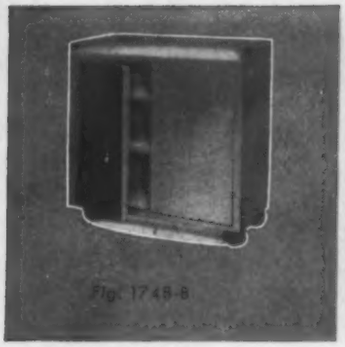
Whether your grinding requires hogging cuts or light finish cuts, fine finish and/or extreme accuracy, avail yourself of Blanchard *Free Consultation Service.* Another Blanchard Service is *Sample Grinding* on which you pay only the transportation charge.

Send for your free copy of "Work Done on the Blanchard", third edition. This new book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY

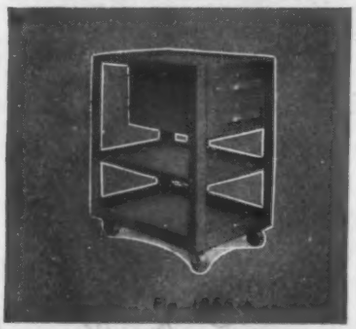
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

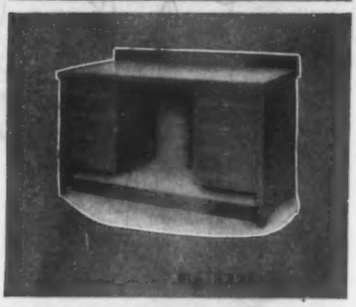


HALLOWELL

SHOP EQUIPMENT OF STEEL

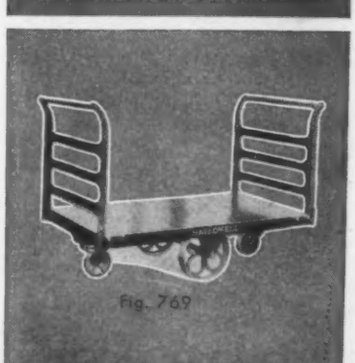
. . . designed for comfort and utility
. . . built for long service and hard wear





and the most exacting requirements of shop and factory can be filled easily with "Hallowell" Shop Equipment of Steel. It comprises: Stools, chairs, work-benches, foremen's desks, tool cabinets, and trucks—in a wide variety of styles and sizes--built of sturdy, hard-wearing steel—a construction that has made "Hallowell" a ***buy word.***

Write for your copy of the "Hallowell" Catalog. It's a handy reference when you order your shop Equipment of Steel.



"Unbrako" and "Hallowell" Products are sold entirely through Industrial Distributors.

OVER 44 YEARS . . BUSINESS

STANDARD PRESSED STEEL CO.

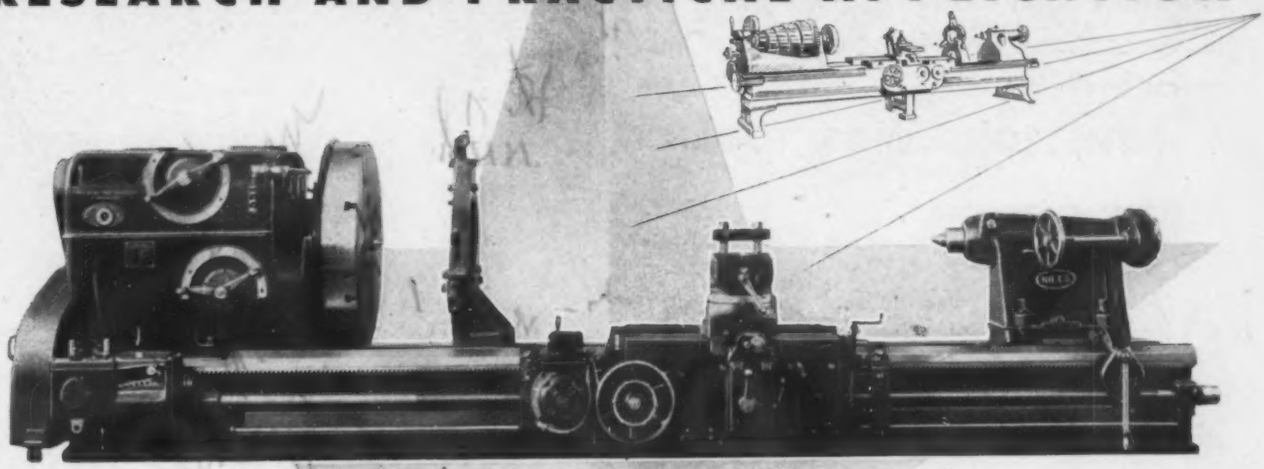
JENKINTOWN, PENNA., BOX [illegible] • BRANCHES BOSTON • CHICAGO • DETROIT • INDIANAPOLIS • ST. LOUIS • SAN FRANCISCO

GENERAL MACHINERY

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

PROGRESS THROUGH 100 YEARS OF RESEARCH AND PRACTICAL APPLICATION



NILES 60" HEAVY ENGINE LATHE

NILES

Check these features . . .

1. Heavy, massive bed extending to the floor line.
2. Compensating V-type Bed ways.
3. Anti-friction bearings throughout Headstock.
4. Hardened and ground Headstock gears.
5. Off-center Spindle.
6. Internal Ring Gear Drive to Face-plate.
7. Automatic flood lubrication to all moving parts.
8. Positive fine-tooth feed clutches in apron.
9. Double-walled apron to support all shafts at both ends.
10. Interlock between Feed and Thread engaging levers.

Write Dept. C for this catalog covering the complete line of Niles tools, and other products made by General Machinery Corporation. Please give your title.

SUBSIDIARIES: ★THE NILES TOOL WORKS COMPANY ★PUTNAM MACHINE COMPANY ★THE HOOVEN, OWENS, RENTSCHLER CO. ★THE HAMILTON PRESS AND MACHINERY CO. ★THE UNITED WELDING COMPANY

PRODUCTS: ★MACHINE TOOLS ★DIESEL AND STEAM ENGINES ★PRESSES ★CAN MAKING MACHINERY ★SPECIAL MACHINERY

Five Star Leadership

ARMSTRONG
Quality WRENCHES

These fine wrenches combine balance with great strength. Accurate openings assure a positive grip on screw head or nut. Engineered designs give increased leverage and applied power. The finest wrench steels, drop forged, heat treated, tempered and tested, give extra strength. Superior "tool sense" has created a line of superior wrenches.

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"

315 N. Francisco Avenue **CHICAGO 12, U. S. A.**

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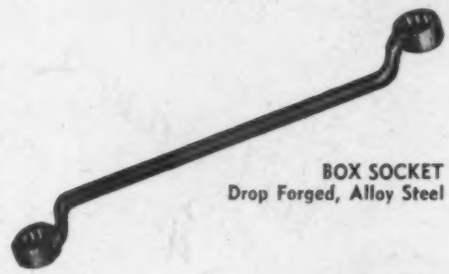
ARMSTRONG Wrenches are cataloged, stocked and sold by leading distributors everywhere.

OPEN END
Drop Forged, Carbon Steel

OPEN END
Drop Forged, Alloy Steel

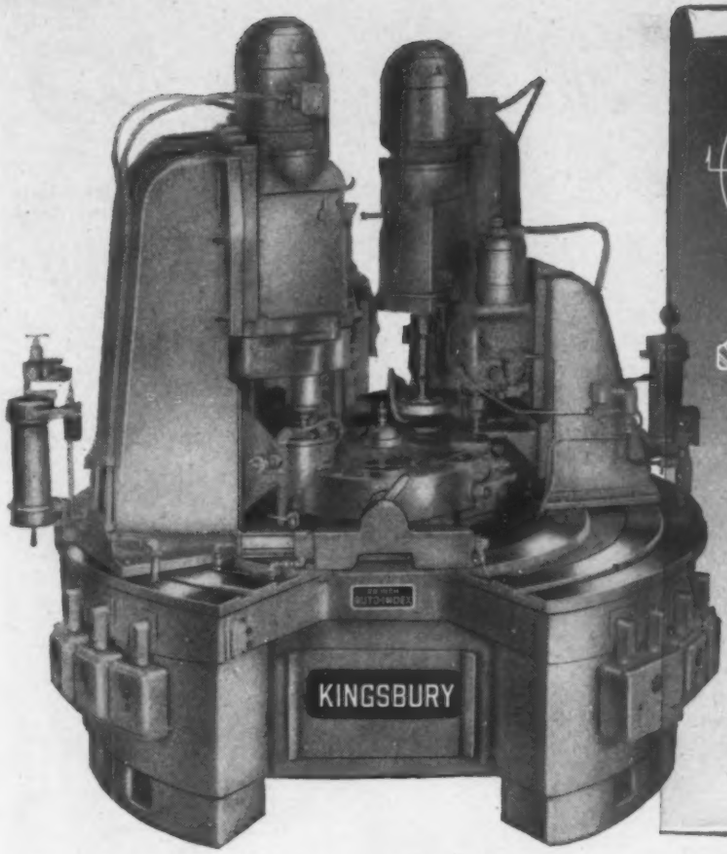


BOX SOCKET
Drop Forged, Alloy Steel

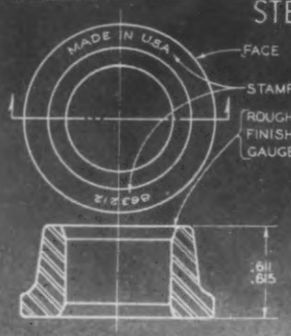
COMBINATION WRENCHES
Open End and Box Socket
Drop Forged, Alloy Steel

CONSTRUCTION AND STRUCTURAL WRENCHES
Both Carbon Steel and Alloy Steel

DETACHABLE SOCKET SETS
Drop Forged Ratchets, Alloy Sockets



STEEL BEARING CONE

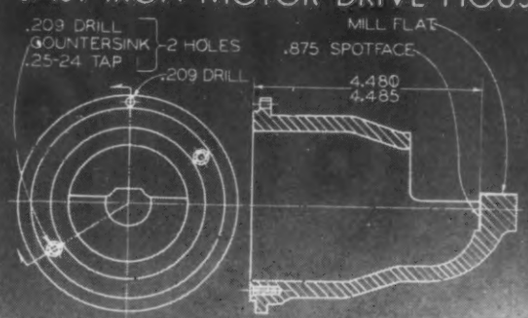


PROBLEM Face, rough and finish form, stamp and gauge 1300 pieces per hour with one operator.

METHOD This is a terrific production rate. The operator only has to load it. Everything else is automatic. An air-operated handle clamps each fixture. A power drive unit indexes the table. Automatic units at 3 stations machine each piece. An air-operated device stamps them. A cam unclamps each fixture during the index. A unit with a plug gauge checks each part and stops the machine if it does not gauge. An arm removes the finished piece. The gross production is 1640 pieces per hour.

COMBINED OPERATIONS *for* HIGH PRODUCTION

CAST IRON MOTOR DRIVE HOUSING



PROBLEM Drill, countersink, tap, mill and spotface 420 pieces per hour with one operator. Maintain accurate depth and central location of the spotface.

METHOD A bushing guides the spotfacing tool. The bushing carrier is mounted on guide rods anchored securely. The shank of the tool has a micro adjusting nut for setting its depth accurately. A multiple-spindle head on a standard unit drills 3 holes. Two others countersink and tap two of the holes. A unit with a standard milling attachment mills the flat. The gross production is 540 pieces per hour.

Kingsbury designs, builds and tools single purpose machines with standard units up to 5 hp each. Send us prints showing your operations and hourly output, and ask for a proposal. Kingsbury Machine Tool Corp., Keene, N. H.

KINGSBURY

Quick-Versatile
ROTARY MILLING & INDEXING

with KNIGHT'S
20" ROTARY TABLE

A SINGLE SELF-CONTAINED MOTOR-DRIVEN UNIT

- Adapts any milling machine for power rotary milling and indexing work within a few moments.
- Setup time is virtually eliminated — just plug into nearest electric outlet for immediate operation. No other equipment or connections are required.
- Ample power is provided for almost any milling operation by a special geared-down motor.
- 18 feed changes for 1½" to 54" per minute make adjustment to any cutting speed simple and quick. An optional feed range from 3" to 108" is available.
- In addition to indexing and rotary milling, the usefulness of the Rotary Table is further widened by its adaptability to many other jobs where an automatic revolving fixture would save time and costly manhours.

Write for Descriptive Literature

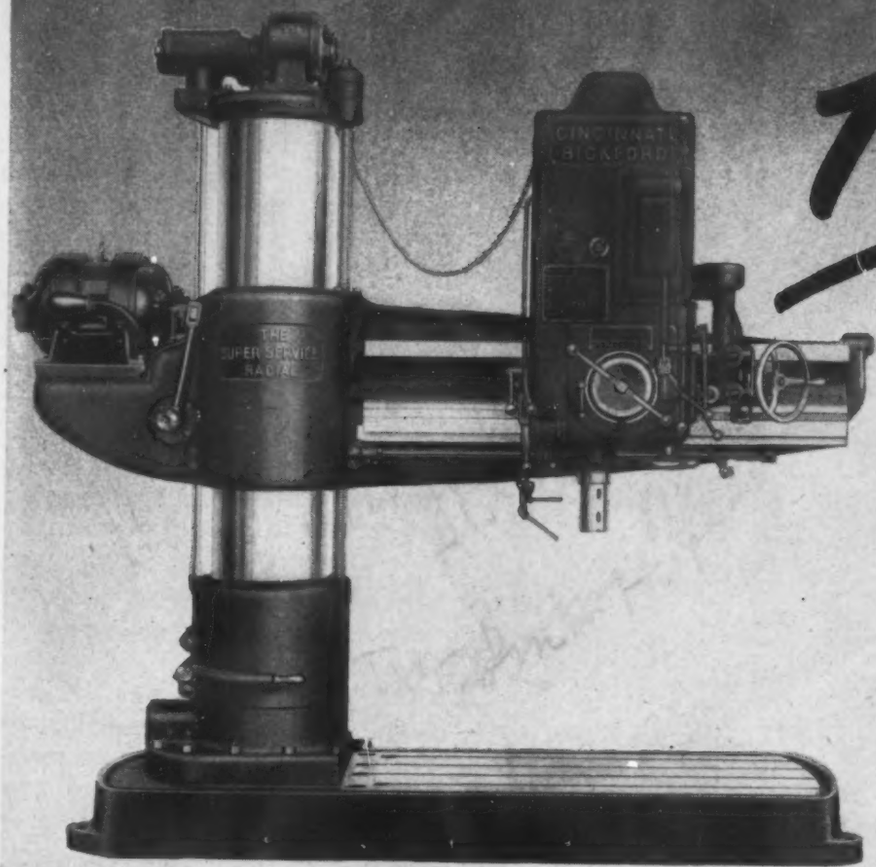
W. B. KNIGHT
MACHINERY COMPANY

KNIGHT VERSATILE MILLERS ACCURATE RIGID

MORE GOODS for MORE PEOPLE at LOWER COST

3920 WEST PINE BLVD. • ST. LOUIS 8, MISSOURI

For PRODUCTION they are tops



These powerful Cincinnati Bickford Super Service Radial Drills handle easily, and operator has complete control through levers placed low on the head. Eighteen feeds and 36 speeds insure the right feeds and speeds for the job.

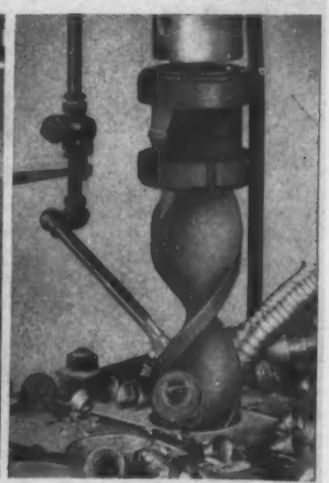
Write for a complete description of the production, safety and special design features of these machines in Bulletin R-24-A.

PIONEERED 19 YEARS AGO

- All controls centralized on head.
- All speed changes in the head.
- Mechanized power rapid traverse to head is standard equipment on larger sizes.
- Automatic oiling.
- Multiple splined integral keyed shafts throughout.
- Sliding gear feed changes.

RADIAL AND UPRIGHT SUPER SERVICE DRILLING MACHINES

Long spindle sleeve bearing for accuracy—10½" boring tool in 9¾" cored hole—.042 feed. No pilot bar is used.



A powerful, rugged and accurate machine is needed for this job. 20 h. p. here—4" diameter drill in steel at 78 R.P.M. and .017 feed.

Equal Efficiency of Every Unit Makes the Balanced Machine

See our condensed catalog in Sweet's File

THE CINCINNATI BICKFORD TOOL CO. Cincinnati 9. Ohio U.S.A.

Multiple Parts BY DoALL CONTOUR SAWING

- World's Fastest Metal-Removing Process
- Miracle Method of Low-Cost Production

Five identical parts like the upper one, were *Contour Sawed* from a steel block in a fraction of the time required by other machine cutting processes. *Contour Sawing* slashes time and cost on countless toolroom, production and maintenance jobs.

All materials, even tough alloys, as much as 30" thick, can be *Contour Sawed*—external, internal, straight and curved precision cutting at any angle. Unneeded portions are sliced off—not whittled down by slow chip removal. Cutting is continuous—no time-wasting backstroke.

Why not profit from the amazing shortcuts possible by *Contour Sawing?* Send for free pictorial booklet *"DoALL Equals Ten Plus"* which shows actual time savings made over other procesess in specific instances.

The DoALL Company

REPRESENTATIVES IN 56 COUNTRIES

DoALL STORES IN KEY CITIES

Des Plaines, Illinois

Cable Address: DoALL, Des Plaines

American Machinist's Spot NEWS OF METALWORKING

Efficiency in radio manufacturing plants is reported not over 60%. Labor costs are high, the industry is back at 1938 level so far as competitive conditions are concerned. Of 152 companies in business, those expecting to survive must increase greatly their efficiency.

Labor barometer: labor market at Chicago has softened for first time in more than a year. However, over 5000 workers were added to payrolls in last 60 days.

Some $60 millions of surplus machine tools have been in storage at Cleveland for several months without WAA being aware of them. They were uncovered when a new WAA regional chief took over. Incompetent help, too much paperwork, changes in procedure and desire of manufacturers to get rid of government surplus machines are the factors blamed for this situation.

Outside engineers imported by Ford are said to be turning a questioning eye on the Ford cast crankshaft. Ford is the only automobile maker who does not have a forged shaft.

New wrinkle in black-market practices: a motor manufacturer badly needed copper wire, finally uncovered 15 million pounds through a scrap dealer, who sold the wire at a stiff price plus a "cut" on each motor in which the wire is used.

> Air Forces find that Germany had 143 underground plants at war's end, producing 20% of all airframes (including most V weapons) and 60% of all airplane engines. Germans favored under-hill excavations, but used mines and quarries. They had trouble with water, falling dirt and rock, and noise reverberations. Concrete-covered submarine pens were effective.

Plastic upholstery promises to come into its own. Harshness of fabrics has been corrected by greater fineness of thread. Pricking the material with thousands of needle-point, almost invisible holes gets away from stickiness in climates where temperature rises above 100 deg. F.

Ford is holding meetings with West Coast shop owners to work out satisfactory plans for having large numbers of car parts made out there. First attempt in February fizzled, probably because California shops, accustomed to small special orders, do not know how to bid on mass-production jobs. To date no contracts have been let and only 25% of the bids submitted are at prices equal to or less than eastern prices plus freight.

Latin American business should be good, but Peru and Chile are having dollar trouble and Argentina and Uruguay may have difficulties later on. Belgium is doing well, but Netherlands will not be in good shape again until German industry is permitted to function. All of this from an observer for a metalworking company who has just completed a wide swing.

About 50% of the firms which recently have made inquiry in San Francisco about West Coast production facilities are machine tool builders or are making products closely allied to machine tools.

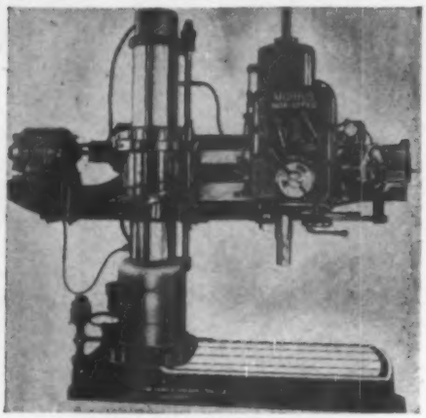
Foundry Educational Foundation has been formed to procure continuous supply of college-trained men to bolster the foundry industry. Headquarters will be in Cleveland, first task is to raise $280,000 to underwrite courses of study at five engineering schools. Project has backing of American Foundrymen's Association, Gray Iron Founders and Malleable Founders' Society.

One automobile company is trying to produce enough service parts for current models to take care of service requirements for next ten years. Real saving is not so much in low production costs achieved while parts are being made in large volume as in tax savings. Tooling now is scrapped as soon as sufficient number of service parts have been run off. Hence there is no question about amortization rate.

One motor car maker is producing all service parts for 1947 models which it thinks will be needed in next 10 years. Real saving is taxes, not low production cost. Tooling now is scrapped as soon as enough service parts are run off, thus establishing a short amortization period. Tax savings far more than offset carrying charges on service parts inventories.

MORRIS MOR-SPEED PRODUCTION MACHINE

More parts In Less Time at Lower Cost



MORRIS MOR-SPEED RADIAL

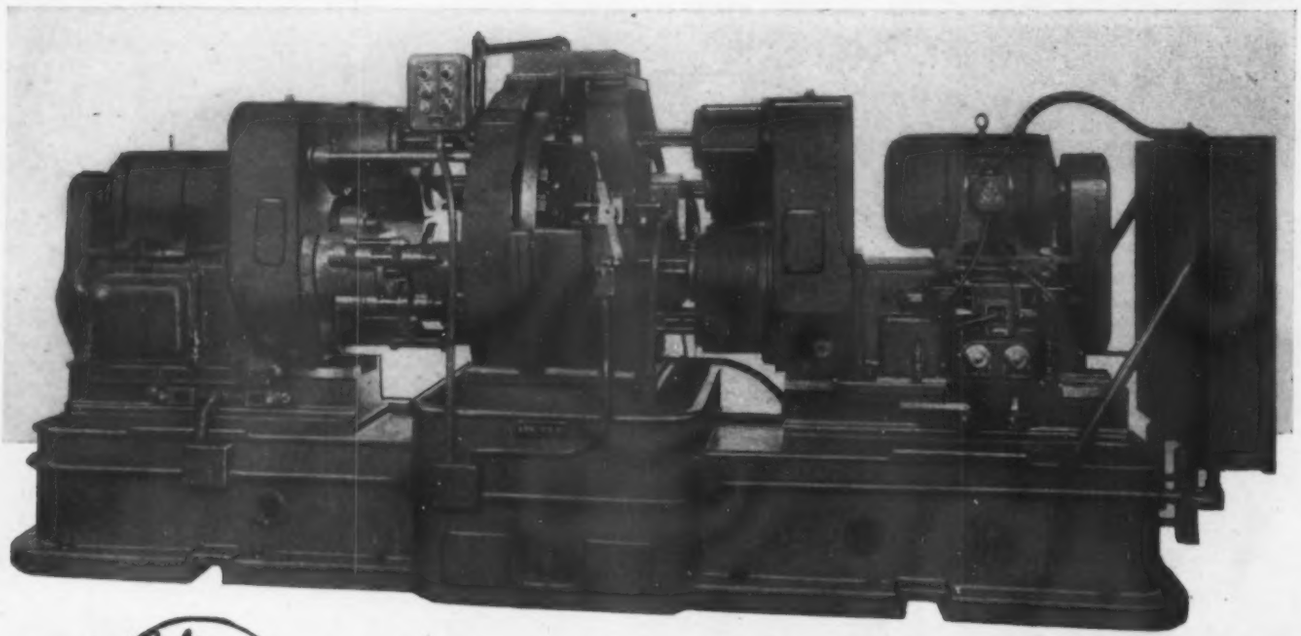
● To adequately meet the competitive situation existing today, manufacturers throughout industry are seeking high production machines to lower costs.

This Morris two-way horizontal machine is typical of the machines being used to increase production and reduce costs. It handles drilling—reaming—countersinking—and tapping operations on *seven* pieces simultaneously.

The two horizontal heads mounted on a sturdy base, each powered by individual motor, are traversed and fed to the work hydraulically. The left-hand head has 21 spindles—the right-hand head has 13 spindles plus a 4 spindle tap head.

The machine has an eight station automatic indexing work head with hand clamping fixtures for holding the work. Incidentally the machine is automatic aside from the loading and clamping—features a push button control—and is used to machine refrigerator compressor parts.

If you have a mass production problem on work requiring drilling—reaming—facing—tapping or similar operations, investigate Morris. They have the experience—the engineering "know-how" and facilities to design and develop equipment that will increase production and cut costs. Write for the new Morris Production Machine booklet.



Builders of MOR-SPEED Radials

The MORRIS Machine Tool Co.

CINCINNATI 3, OHIO

American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

"Learning a Trade"

There has been a dearth of apprentice training since the 1920's. Our supply of all-round machinists has steadily dwindled.

If that sounds like too strong a statement, examine the facts for yourself.

In the depression years the training of apprentices was allowed to lag because of bad business. When things got better in the late thirties and the war came on, men were needed quickly.

The result was the inauguration of a large number of "learner" programs which made possible the "quickie" training of tens of thousands of workers in a matter of weeks.

There was not time for three-year and four-year courses. The pressure was on to get things done fast. And improvisations instead of long-term plans were the order of the day.

But all of the training done during the war years could by no stretch of the imagination be called "learning a trade."

You don't learn a trade overnight, or in four weeks, or in four months. Four years is nearer the time required. It is a painstaking task calling for earnestness on the part of the apprentice, a willingness to stay with a project much as a college student does in earning a degree, and sympathetic understanding by the employer.

Good, all-round machinists have been at a premium for years. They still are scarce today. And nothing on the horizon indicates that this shortage will be remedied in the near future, or for some time ahead.

For the truth is that for almost two decades apprenticeship in the true sense has been neglected or has not been accorded the attention which it deserves.

Just now many metalworking companies are awakening to the desirability of training an adequate number of apprentices. They are being aided by the Apprentice-Training Service of the U. S. Department of Labor, and in some cases by State apprentice-training organizations.

We can think of no better insurance of an intelligent, experienced labor force for the future than to put into training today an adequate number of fledglings who will be tomorrow's skilled mechanics.

If we do not step up to this opportunity, we are deliberately inviting trouble at some future date.

Instead of having at hand the men with adequate know-how, we will be compelled to rely upon less efficient workmen. And that means lowered productivity and higher costs, from both of which we are trying to get away at this time.

Remember that good apprentice training produces not only proficient, versatile workmen, but also the kind of men who are logical candidates for promotion to key production jobs later on. These are the men who form the backbone of every good manufacturing organization.

Because we believe so strongly in the tenets of apprentice training, we present in this issue beginning on Page 113 a special editorial report on the subject. We recommend it.

Burnham Finney

EDITOR

THEY LIKE IT TOUGH

Courtesy of
Federal Engineering Co.,
Detroit, Mich.

In the large tool and die shops of industry . . . day in and day out . . . standards are tough. The die steels are tough, and performance demands are tough.

Powerful, sturdy Cincinnati Shapers are found in these shops, for they are dependable on the tough job.

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THE CINCINNATI SHAPER CO.

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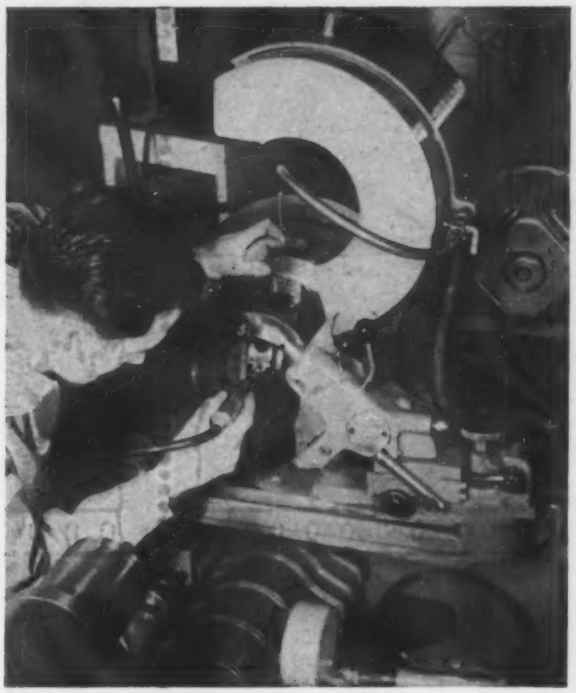
SHAPERS · SHEARS · BRAKES

BORES GROUND TO HALF A MILLIONTH

Precision to five millionths of an inch and smoothness to half a millionth have been obtained in internal grinding by throwing tradition overboard

BY E. J. TANGERMAN
MANAGING EDITOR



Typical close-tolerance grinding setup. Nine annular holes are ground to a tolerance of fifty millionths. Here Stan Kozak, operator, checks holes with an air gage

AS THE DEMAND for finer surface finish and greater dimensional accuracy has grown, it has been necessary to supplement the best internal-ground finishes by lapping and honing. Grinding has been considered as a process which accomplishes dimensional changes in work with relative rapidity, consequently requiring a wheel of comparatively free-cutting characteristics, contributed to by sharpness and size of abrasive particles, which in turn must be held in a bond that is not over-hard.

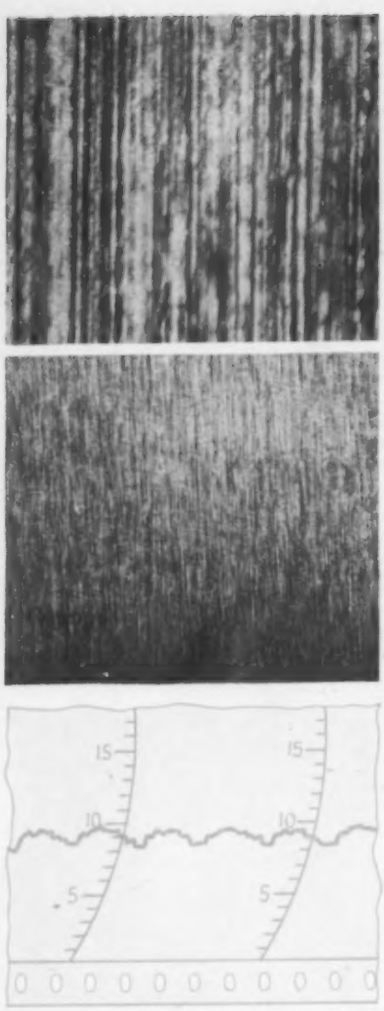
As a free-cutting wheel has been found to leave a finish of coarser microinch reading than is now required, harder, finer and denser wheels have been used in the effort to reduce this reading. However, while such wheels produce finer finishes, the usual materials on which such finishes are required are so hard and/or tough they cause the wheel to glaze. This, while it does give an apparently smooth surface, is usually fatal to holding the required dimensional accuracy, and at best results in work surfaces which are checked and burned.

Under such conditions, accepted practice has been to grind to fairly close dimensions, then to hone or lap to remove grinding scratches and chatter and to control final size and finish.

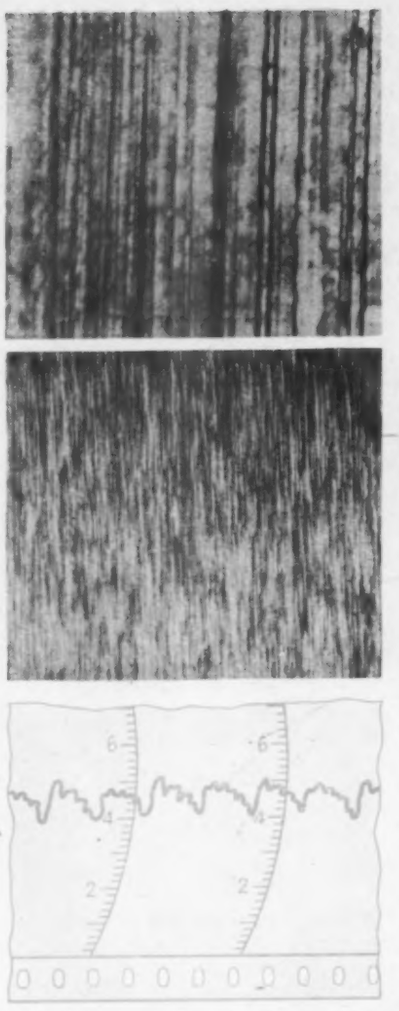
Experiments during the past ten years, however, by Glen Green, research engineer for Bryant Chucking Grinder Company, and his staff indicate that in internal grinding, at least, size, straightness and roundness of bore can be controlled within ten millionths of an inch in production and five millionths on a tool-room basis. Further, surfaces have been brought to a smoothness of half a microinch (0.5 rms). What's more, the holes have been roughed and finish-ground in one chucking, using the same wheel.

The original problem was to solve the single riddle of grinding to accurate size, but it was not long before it became apparent that surface finish was an integral part of this problem, because indentation within the region of surface finish may be an appreciable error. Many factors were found to play a part in the solution: rigidity and alignment of the machine, vibration from workhead and wheelhead drive, isolation of the machine, design of the ways or slides, feedscrew design to give closely controlled microfeeds, close temperature control in room, coolant and hydraulic oil. But the major factor seems to be complete abandonment of the common belief that higher finishes demand harder, finer and denser wheels, for Mr. Green uses *relatively coarse, open-structure wheels,* thus obtaining free cutting and proper temperature control throughout the grinding process and avoiding checking and burning of the work surface.

The early investigation of ultra-precision grinding proved that the standard conception of a grinding machine had to be changed. To begin with, the slides of the machine were oil lubricated, carrying the moving member on a fine film of oil. It was found that no matter how closely the parts were fitted, the moving member still had some "shift" to it. The ways were redesigned and ball sleeve bearings on



A 9- to 10-rms. ground surface from a 1¼-in. ring gage. Profilometer (motor-driven head and in a constant-temperature room) chart, 500-dia. brightfield photomicrograph and 18-dia. dark-field photomacrograph are shown. Brush analyzer charts show smaller rms. values in each case by 30% or more



A 4- to 5-rms. ground surface, similarly shown. Profilometer reading is on 10 scale, hence magnified three times over the preceding one. Steel for all test pieces is SAE 4150, hardened to Rockwell Co1. Finished surfaces are C59-63, indicating that surfaces are unchanged by the precision grinding

An 0.6-rms. ground surface. Profilometer reading is on 3 scale, magnified ten times over first surface, 3.3 times over second. Dark spots in 500-dia. photo are nonmetallic inclusions. (Surface equal to that produced by electrolytic polish) for metallographic specimens, without loose or smeared material.

hardened cylindrical slides were used for wheelhead and cross slides.

Next, alignment was investigated and it was found that taper cannot be corrected by "cancellation of errors." In other words, vertical misalignment cannot be compensated for by simply swinging the head horizontally. When the workhead and wheelhead spindles are properly lined up, a straight hole can be ground with the wheel contacting either side of the hole.

The next problem was chatter. It was found that to grind to tolerances of millonths of an inch for roundness and straightness, chatter had to be eliminated. The spindles were mounted in special precision bearings and statically and dynamically balanced to eliminate vibration.

Mr. Green determined that chatter is an indication that something is out of balance and that once the wheel is properly mounted and rotates about one center it presents each cutting edge of the wheel uniformly to the work. With the alignment of the machine checked so that the wheel is traversed in one line, it is not possible for one section of the wheel or even a few odd grains to cut deeper than the others and make a patter or chatter.

To maintain stability of machine alignment, precautions had to be taken against vibration and temperature change. A precision machine should be mounted on a suspended concrete block. Bryant finds 4 in. of cork-chip packing for the foundation block sufficient to absorb shock from other machines in the shop and vibration from heavy trucks and passing trains. Temperature control is not confined to air-conditioning the room. The coolant for the machine is passed through a refrigeration unit and held at 68 F. This same coolant is circulated through the wheelhead to maintain machine temperature. The hydraulic oil for operating the machine is passed through a second refrigeration unit and held to 68 F.

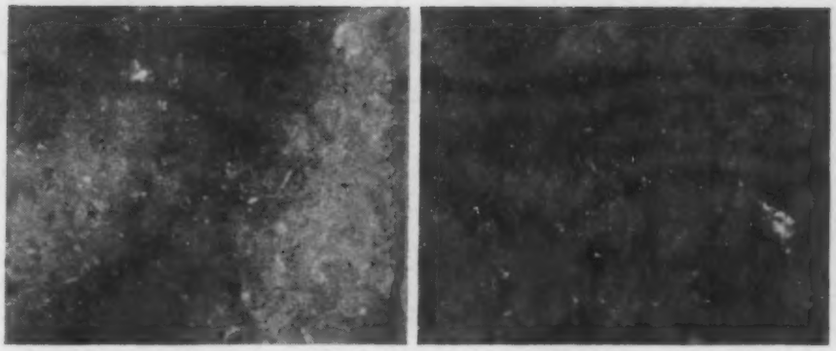
Experimenting with various wheel grits and structures brought several interesting and unexpected results. It was found for instance, that surface finish was controlled by align-

ment and stability of the machine rather than grit size. A 60-grit wheel was found to give as fine a finish as an 80- or 100-grit wheel.

It was discovered that even though vibration had been removed, the work made to rotate smoothly, and the wheel was carried in a constant path, there was another factor that induced taper in a hole. A five-structure wheel was used to grind a hole. The setup was unchanged except that an eight-structure wheel was used. The hole was ground and developed a 0.0001-in. taper, opening up at the back. The wheel was changed to a twelve-structure and the back of the hole opened up another 0.0001 in. The head was then swung to straighten out the hole and the eight-structure wheel was used again. The hole closed in 0.0001 in. at the back. The five-structure wheel closed the hole another 0.0001 in. The conclusion was that the close-structure wheel, requiring more pressure to grind, deflected the spindle. The open-structure wheel required much less pressure and was, therefore, a cooler and more free-cutting wheel.

There has been an opinion that holes are not *ground* to surface finishes of under one microinch but are *burnished* or *peened* to finish, so "amorphous metal" results at the surface because the wheel is glazed and dull. This is apparently diametrically wrong.

A simple demonstration will help to clear up this point. A piece is chucked and rough-ground. The wheel is trued and the hole is sized, leaving a finish of under one microinch. A new piece is chucked and without dressing the wheel, the hole may be rough-ground. A glazed wheel would not cut under such conditions.



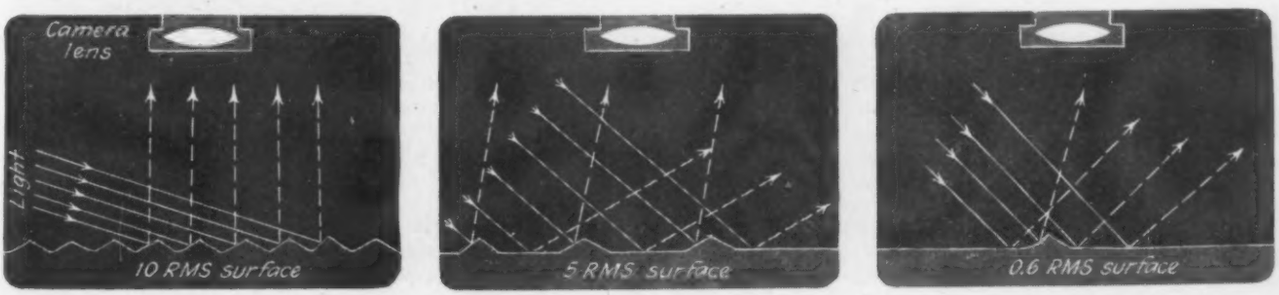
WHEELS. *contrary to general belief, are* ***not*** *glazed or dulled for final cuts. Here are 18-dia. photomacrographs of the 38A6018VBE (8-structure, 60-grit) wheel used on the 0.6-rms. sample, first of the new wheel, second of the rinsed wheel after cutting*

The new technique has been tested on a number of jobs of varying types, including diesel injectors, bearing races, pump bodies, drawing dies and ring gages. In each case, required tolerances have been attained. W. J. Darmody, in tests at Springfield Armory, reported a "surface finish equal to or better than most gage blocks" on a ground ring gage and predicted such gages would solve the problem of measuring within the region of depth of the surface finish. Tests of ground ring gages at the U. S. Bureau of Standards indicated parallelism, straightness and squareness 4 to 5 microinches and finish within half a millionth rms., without burning or distortion of the metal; and bell-mouthing at the wheel-entry surface for only a thousandth or two, readily removable in final grinding of the face.

Further, tests have indicated that the surface is equivalent to a lapped one in accuracy and wear resistance. A group of tungsten-carbide wire-drawing dies have thus far outworn previous lapped dies by five to one, apparently largely a result of control of "shape" (roundness, angular control) by free cutting in final finishing. That free-cutting occurs is assured by dressing the wheel before the final pass.

The Bureau of Standards is now testing a further series of ring gages ground inside and outside to these tolerances—the object being to determine how much enlargement or distortion of the entire gage occurs as a result of mechanical gaging of the bore. That this is a measurable amount is known—blowing your breath on, or squeezing a ring gage being bore-gaged will distort it as much as five millionths, "wiping out the dust" with a fingertip will deposit a layer of oil half a millionth or more thick. It has been found necessary to do comparison-gaging with a pneumatic gage to reduce these distortional effects.

How dark-field photomacrographs are taken. *As surface becomes progressively smoother, less and less light is reflected from irregularities into the camera lens. Photos do* ***not*** *show the actual cuts, but light reflected from one side of them. Light is diffused by the cut, so apparent size of cuts is amplified. Thus the surface with the greatest number of cuts appears brightest, that with the fewest number of cuts appears darkest*

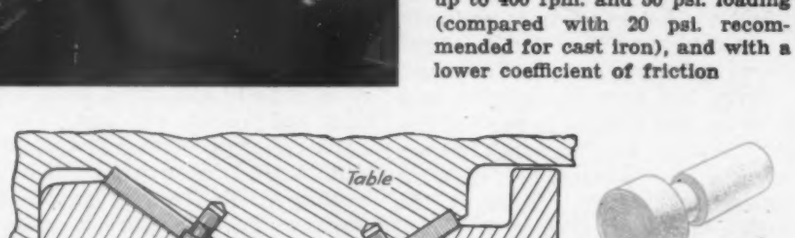


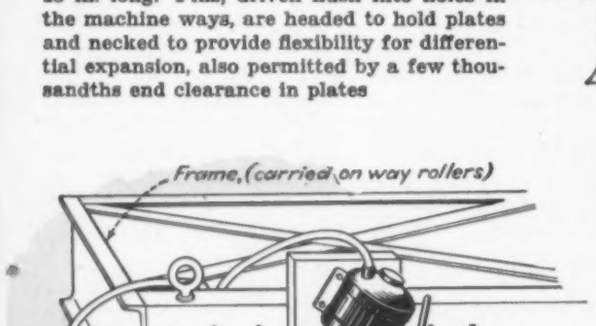
Reduced Wear On the Way

Fabric-reinforced phenolic sheet provides low-friction planer ways for loading to 50 psi. and speeds to 400 fpm., based on over 30 installations by G. A. Gray

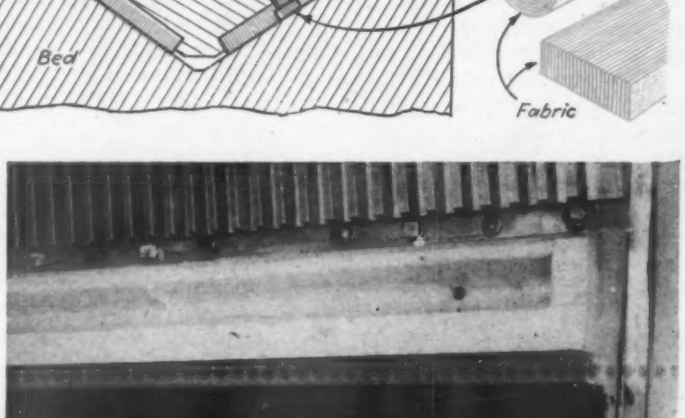
PLATES AND PINS are machined in place just as any other material would be, and oil grooves are cut in the normal way, across pins and plates alike. Here flat ways are being machined, to an accuracy and finish comparable with that obtainable on cast iron. Finished ways can be operated at up to 400 fpm. and 50 psi. loading (compared with 20 psi. recommended for cast iron), and with a lower coefficient of friction

REINFORCING FABRIC is at right angles to the bearing surface in both plates and holding pins. Sheets ⅜ x 30 x 96 in., made of Bakelite phenolic resins by Formica Insulation Company, are cut into strips about 18 in. long. Pins, driven flush into holes in the machine ways, are headed to hold plates and necked to provide flexibility for differential expansion, also permitted by a few thousandths end clearance in plates

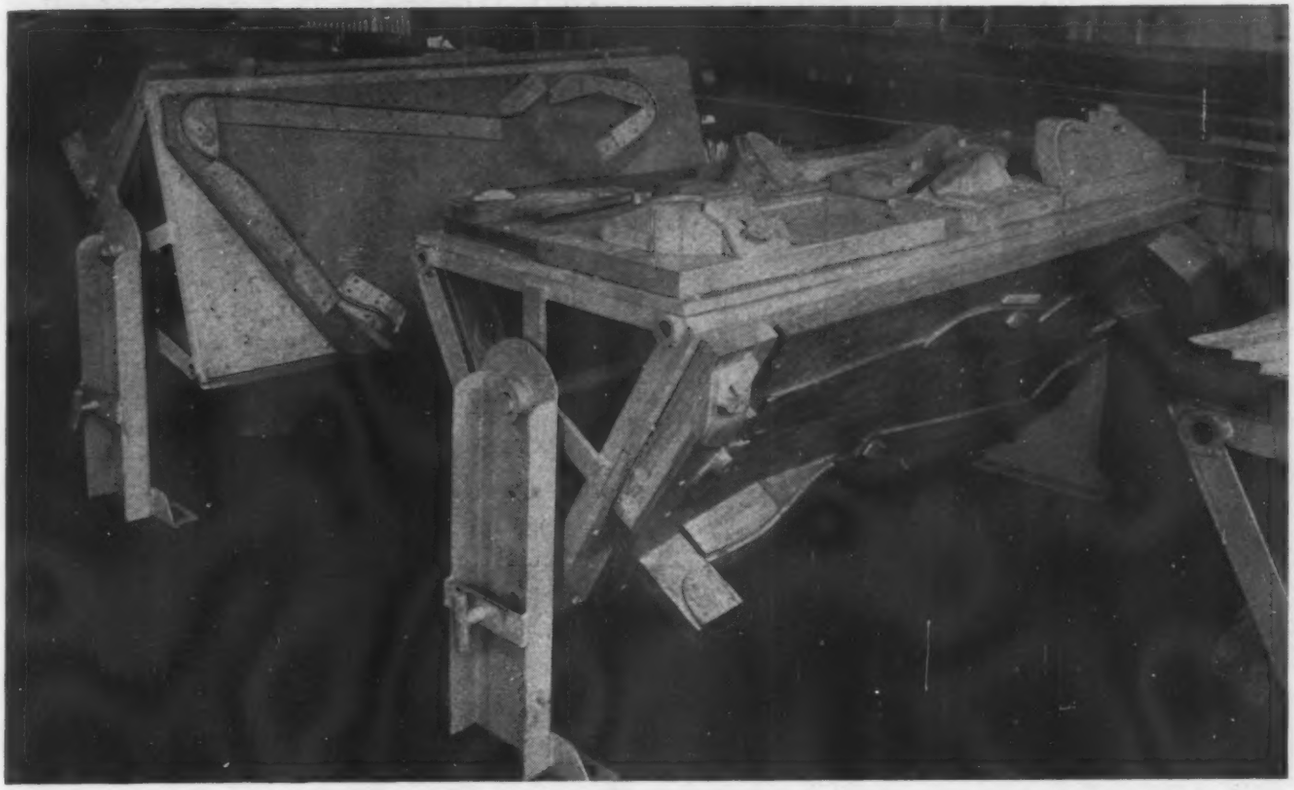




PIN HOLES are drilled quickly by way drills adjustably mounted on a roller carriage which can be let down solidly on ways. A corner of the V-way fixture is sketched, showing the belt-driven keyed shafts fed by hand. Plastic crumbles to powder when cut, so foreign bodies or dirt cause no burns or scoring. Oil of about 300 Saybolt is recommended, although little sensitivity to oil is encountered. Over 30 planers with plastic ways have been sold by G. A. Gray Company, patentee. Several other machine-tool builders are experimenting on boring-mill tables, etc.



FIRST INSTALLATION of plastic ways was made on a 60-in. x 16-ft. openside planer for McNally-Pittsburg Co., Pittsburg, Kan. Mr. McNally reports that examination six months ago, after two years of operation, showed no wear on ways and original tool marks still evident (closeup pictured). Low heat transmission through the plastic minimizes table curl even under heavy loading, maintaining accuracy and reducing danger of dirt on ways. Groove and hole at V-apex feed trapped oil through internal tube to opposite end opening at high speeds



FORM BLOCKS for bending of copper tubing are nested on plywood faces of the triangular turntable fixture. The answer: less floor space, no lifting and lugging by workers and no interference between forms

MECHANICAL BACKS BEAR THE BURDENS

Production of heavy Autocar trucks demands ingenious handling aids to preserve quality, reduce the manual effort, and increase safety

BY HARRY S. WHAREN, ASSOCIATE EDITOR

THE MOST effective rule in handling of materials is, "If you don't have to, *don't.*"

But when it becomes necessary to move materials through manufacturing processes, study of each operation can show how to handle stock, parts and assemblies at least cost, in the shortest time, with the least worker fatigue and greatest safety to men, materials and machines.

The Autocar Co., ever mindful of these objectives, has developed a number of handling aids that complement the standard materials-handling system. These aids, each usually developed for a specific purpose, have gone far toward raising worker productivity, increasing safety to workers and parts, and decreasing expenditure of manual effort and production costs.

Turntable Bending Fixtures

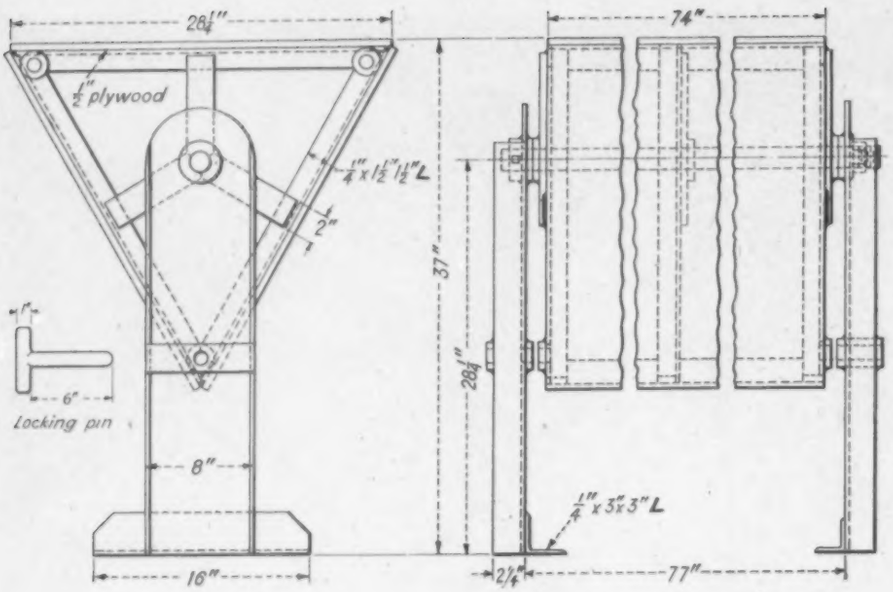
In the production of highway trucks, many feet of tubing must be bent for gasoline and air-brake lines. Previous practice, particularly for air-brake tubing, was to hand-bend it to shape on the assembly line. But this not only meant slowing up line production because of the relative slowness of hand bending but also a wide variation in similar bends.

To eliminate free-hand bending and supply prebent tubing to assembly, a number of hardwood (oak) forms were developed. About sixty, costing on an average of $25 each and weighing from 25 to 150 lb., were needed for the various tubes.

These forms were stored on three 40-ft. benches. The heavier forms were stored on top of the benches and used in that position. The lighter forms, however, were stored underneath the benches and had to be moved by hand to workbenches.

This resulted not only in considerable extra handling work but also in wear and tear on the forms, which although made of hardwood are easily damaged by dropping or bumping. Moreover, storage and working areas required a total of 880 sq. ft. of floor space.

To reduce handling, damage to forms and floor-space requirements, form blocks were mounted on turntable fixtures. Built up primarily of angle and channel welded together,



TUBE BENDING is done in a triangular-frame fixture. Frame is supported on end trunnions and locked by a 1-in. pin in each trunnion engaging circular corner insets. Forms mounted on plywood faces are held at comfortable working height

CHASSIS TURNOVER—From the load beam, suspended from two overhead hoists, two chains lead through pulleys to the truck chassis. The rear end of the chassis is clamped to the turning fixture that controls height of turnover and swinging of load

the fixture is 81½ in. long, 37 in. high and 28¼ in. across each face. The triangular frame is supported on end trunnions by a 1½-in. cold-rolled axle, and can be swiveled to any one of three working positions by withdrawing the locking pin on each trunnion.

The three faces of the frame are covered with ½-in. plywood on which the form blocks are nested before being screwed into place. A face may have only one block, whereas another may have several nested together according to shape and size.

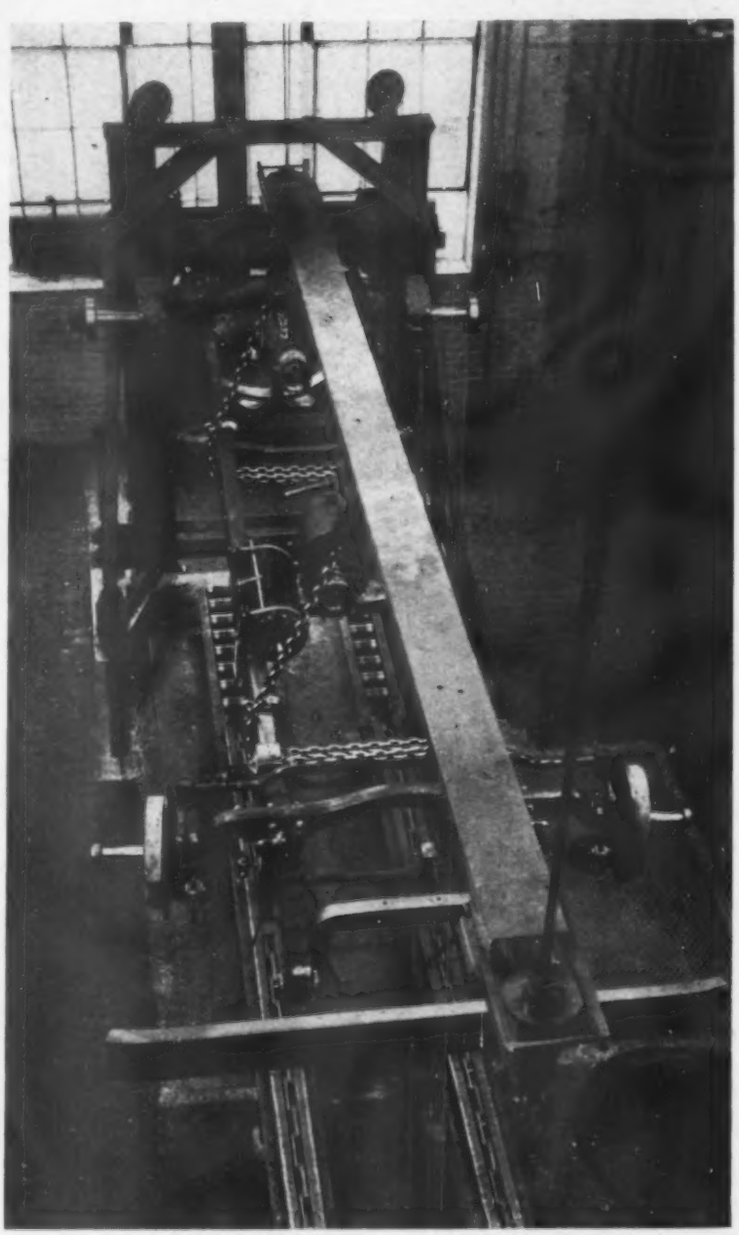
Only five fixtures are now needed to mount the sixty forms. They occupy 240 sq. ft., as compared with the previous 882 sq. ft., and have speeded up tube bending with far less tiring effort by the workmen.

Chassis-turning Fixture

Chassis subassembly with the chassis upside down for convenience in installing axles and other parts means turning it over before delivery to final assembly. With a large truck chassis, this can be a hard and dangerous job without proper fixturizing.

After visiting other automotive plants and studying their installations, plant-layout engineers at Autocar designed one to fit their particular conditions. With chassis subassembly on the first floor and final assembly directly overhead on the second floor, turnover is followed by elevating and feeding the subassembly to the final-assembly line.

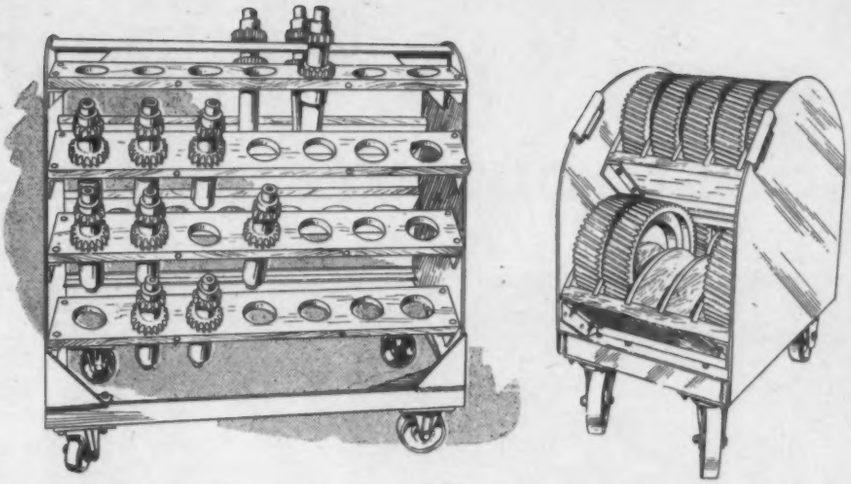
At the end of the chain-driven subassembly line, the turning fixture is wheel-mounted on rails. The outer framework of angle iron and channel supports an inner, counter-balanced unit consisting basically of a steel channel-shaped brake ring mounted on rollers. Two horizontal pair of angles are fastened to the ring to receive the projecting rear end of the chassis, which can be held within the parallel angles by hooks engaging the rear-spring cross-shaft or by a pin dropping down over the rear cross-member.



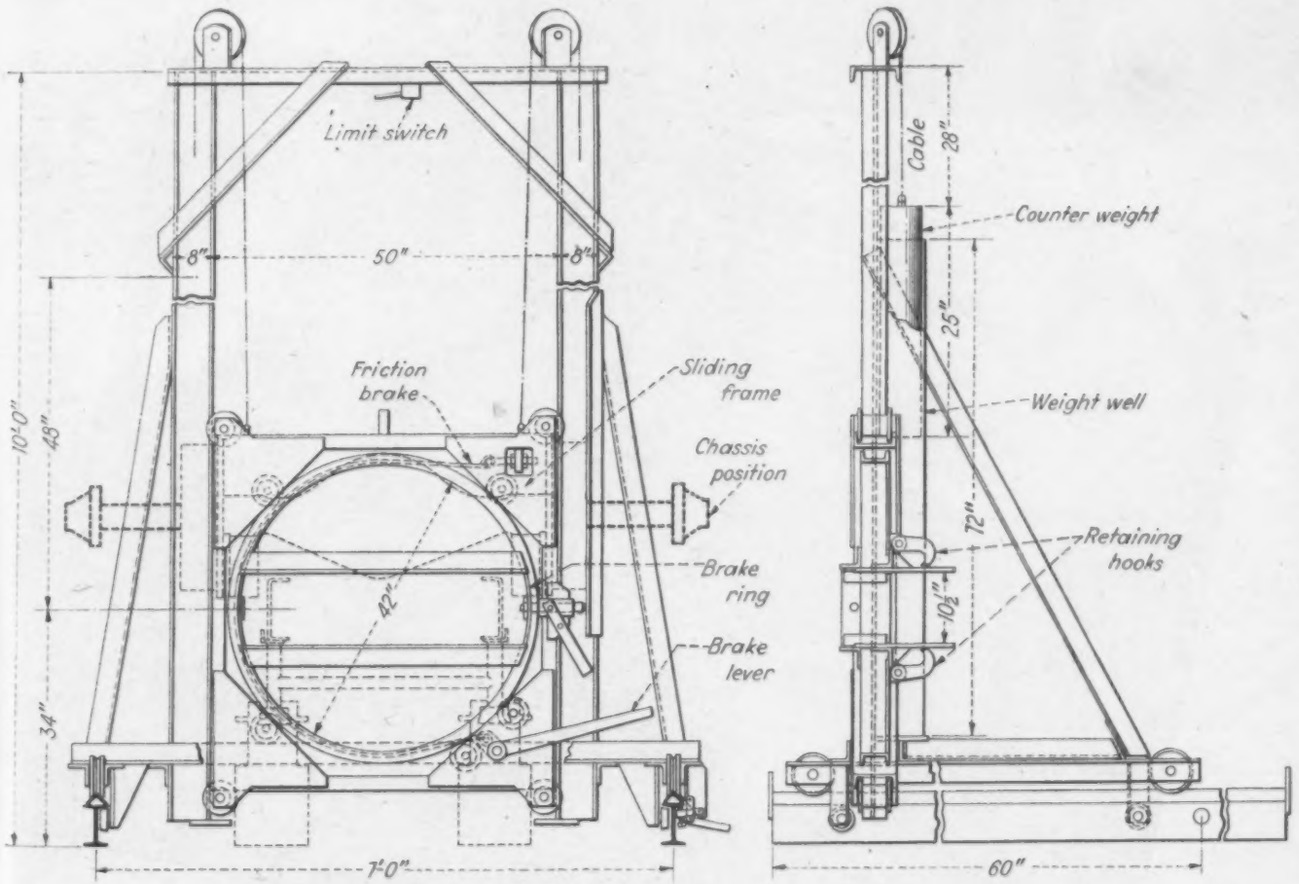
The chassis is picked up from the subassembly line by two overhead hoists supporting an intermediate beam. To each end of the beam is fastened a pulley that can revolve up to 180° as the winding drum winds up and so keeps the cables vertical. Two other pulleys suspended from the beam carry chains which are looped around the chassis.

After the chassis is chained to the beam and hooked into the turning fixture, it is hoisted high enough to clear as it is rolled over. A safety locking bolt on one upright of the fixture engages the ring and cannot be withdrawn until a safe height (48-in. travel) is reached. A slight push will then start the roll-over as the center of gravity is high on the inverted chassis. To prevent wild swinging of the load, a strap friction brake, operated by a hand lever, encircles the ring.

The whole fixture was intentionally designed so available parts could be used in its construction.



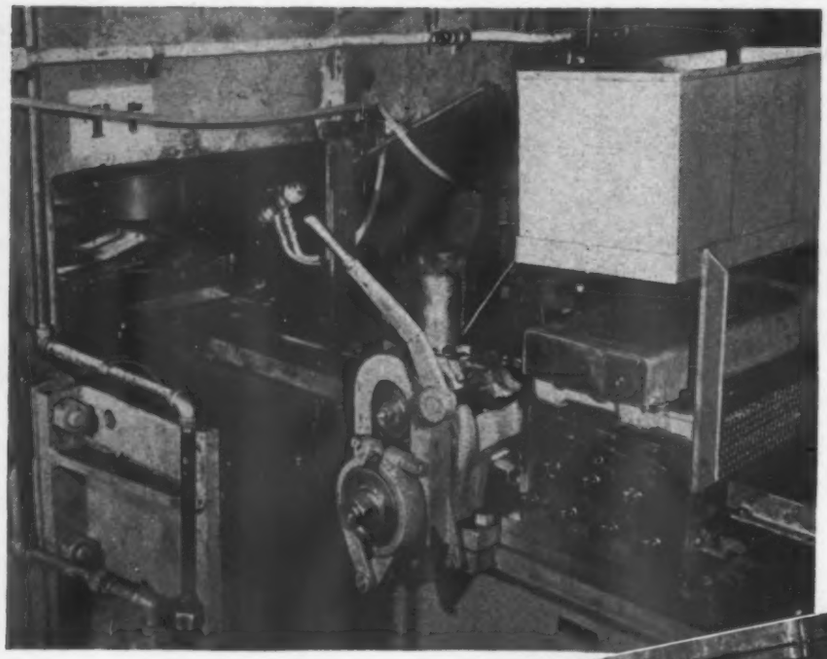
RACKED TRUCKS—Damage to gears from handling them loose in live skid boxes led to the development of racked trucks for moving them from the first machining operation through remaining processes including heat-treat and grinding. Spur gears are handled on vertical pin racks while cluster gears (transmission drive shafts and countershafts) are stacked individually in holes bored in rack shelves. Larger gears, which require extra care to prevent nicking of teeth, are moved through production on trucks having V-shape troughs separated into individual compartments by heavy spacers. All such trucks have two castered wheels for ready maneuverability from machine to machine and on through subsequent processing operations



THE TURNING FIXTURE, built up primarily of angles and channels, has an inner unit that slides vertically between outside columns. The brake ring with its friction brake turns on rollers and eases the chassis over with little swinging. The entire fixture is mounted on wheels, guided by angle and I-beam rails, so it can be brought forward to receive the chassis and wheeled back out of the way after rollover. An adjustable toggle brake can clamp the fixture at any position along the rail. Use of parts available in the plant reduced expense of the fixture

TRANSFER PRESSES

BOOST OUTPUT AT AC SPARK PLUG



Economies in floorspace, labor, materials and tools are obtained. As many as nine operations are performed, and the finished part is removed by a belt conveyor

BY HUBERT L. CURTIS
Master Mechanic
AC SPARK PLUG DIVISION
GENERAL MOTORS CORP.

1 *Coil stock is power fed through the end uprights, or . . .*

2 *. . . Coil stock may be fed across the bolster. In either case, when the ram rises - the transfer fingers move the piece progressively to the next station*

INSTALLATION of several large transfer-type presses is now nearing completion at AC Spark Plug Division, General Motors Corporation, for the production of metal stampings used in the manufacture of automobile accessory products. Some of these parts for oil-bath air cleaners, carburetor intake silencers, and crankcase breathers lend themselves particularly well to the transfer method of production.

These installations are in keeping with a need for greater output to meet increased demands, and a desire to increase output by use of efficient modern methods, and without a proportionate costly increase in floorspace requirements. The use of transfer-type presses accomplishes the above objectives. By combining as many as nine operations in one press, substantial savings in labor and floorspace are realized for two reasons: (1) less space used for presses and (2) there is no banking necessary between the operations, also banking between fabrication and assembly line can be kept at a minimum. As compared to single operations, set up to run simultaneously on individual presses, a saving of approximately 40% in floorspace is possible.

When compared to progressive dies, operating with double-roll feed and scrap cutter, which is another high-production method of making stampings of this nature (also known as cut-and-carry dies or follow dies), the transfer press offers other advantages. These are: (1) up to 12% stock saving because no strips are necessary on the sides to carry the parts along, and (2) the dies are less expensive to build and to maintain. The shape of the part, however, sometimes makes it inadvisable to use the transfer method. In general, round, fairly deep stampings are ideal transfer jobs.

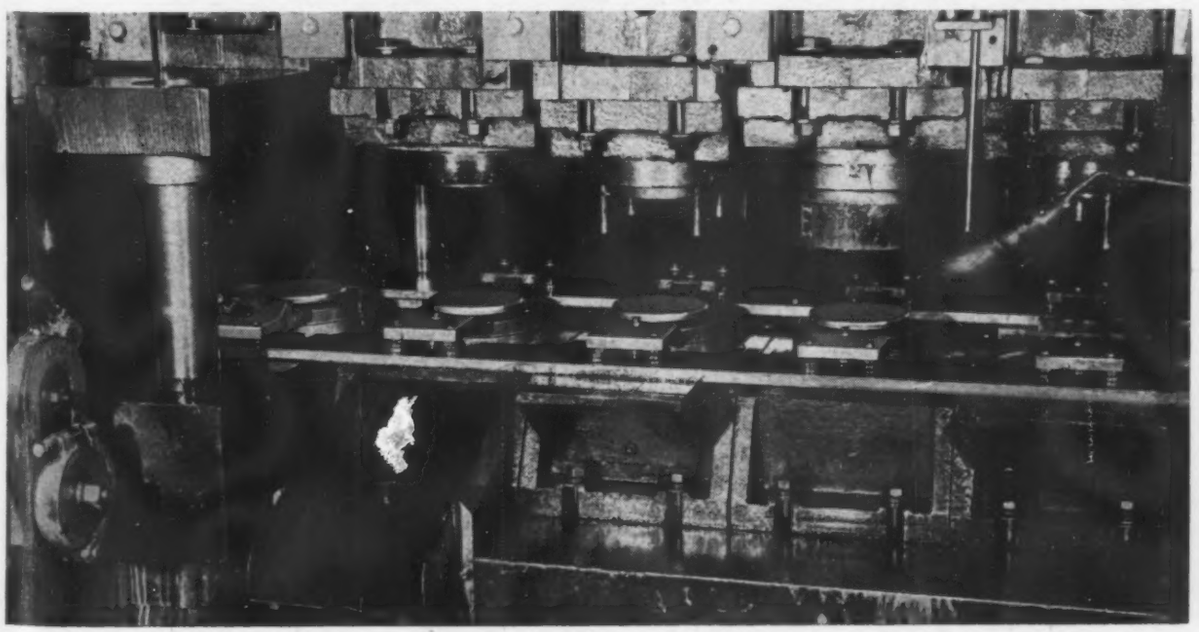
The dies are built as simple single units which can be removed and set up separately in individual presses. This flexibility is valuable in case of schedule conflicts, breakdowns or for runing short runs for service after a part has become obsolete. In the blanking station, Figure 2, it is necessary, because of working tolerances in the ram, to employ guide posts to prevent shearing the edges of the blanking die. As handled on transfer presses, the operations may include: blank and draw; redraw, strike, pierce, trim, extrude, emboss, wipe skirt, and pierce side holes with cam-operated punches.

Units installed in the early part of the program at AC are Verson all-steel presses, equipped with Littell roll feeds, and having hydraulically operated transfer mechanisms. As a result of a trend on the part of product engineers toward larger and deeper silencers for better silencing, it has been necessary to add presses with greater distance between uprights and higher tonnage ratings in order to permit more operations. Present parts are up to 8½ in. dia. and average 4 in. in depth. The earlier presses are 96 in. between uprights, are rated at 215 tons, weight 95,000 lb., have 12-in. stroke, operate at 15 strokes per min., and have six stations with 14 in. between centers. All presses are equipped with air cushions in the bed, and the main ram has individual slide extensions for each station equipped with an air cushion. Each individual slide in the main ram has 2½-in. adjustment vertically, permitting various heights of dies to be used and adjustments to be made as needed in any given station. The later presses are 138 in. between uprights, are 231 in. high, are rated at 500 tons, weigh 209,000 lb., have a 14-in. stroke, nine stations 14 in. apart, and operate at 15 strokes per min. This means that a finished part that has had nine operations performed on it drops off the press every 4 sec. Parts are made of steel furnished in coils and range from 0.010 to 0.050 in. thick with most pieces calling for 0.015- to 0.037-in. material.

Transfer presses now installed at AC Spark Plug

MAKE	SIZE	RATING, TONS	CRANK DIA. IN.	R-L, .IN
Verson	7-B-96	215	7	96
"	7-B-108	300	7	108
"	10-138	500	10	138
	350-S2-136	400	10	136
Bliss	6-72	150	6	72

3 *Once the transfer-press setup is functioning properly, the operation proceeds automatically, the finished part being pushed off the end of the press (at right) onto a conveyor for transportation to the washing machine*



Die Design FOR ALUMINUM ALLOYS

Beer barrels and cooking pots, kettles and canoes demand each die design be based on practical consideration of fundamentals

BY E. W. MASON
DEVELOPMENT DIVISION
ALUMINUM CO. OF AMERICA

EASE OF forming of aluminum has contributed to its widespread use. The metal can readily be fabricated into a variety of shapes by practically every metalworking process.

The metalworker, however, should not think of aluminum as one material, but rather as a series of alloys which come in a wide range of mechanical properties. As the characteristics of these alloys affect shop practices, they should be thoroughly understood.

Seven wrought aluminum alloys are commonly used in metalforming operations. These are designated by Alcoa as 2S, 3S, 52S, 61S, 24S and Alclad 24S, Alclad 14S and Alclad 75S.

These range from the weakest and most ductile to the strongest and least workable aluminum alloys produced commercially in sheet form. Each alloy possesses characteristics which make it the preferred material for certain applications and operations.

Drawing of aluminum alloys is done on the same equipment used for other metals. Deep draws are made on double-action presses, while shallow draws can better be made on single-action presses because of their high operating speeds.

Even on large single-action presses, speeds may be as high as 60 strokes per minute, while small presses run as high as 400 strokes per minute. When a blankholder is required on a single-action press to prevent wrinkling, an air cushion is attached to the press or spring-loaded plates are built into the dies.

Required Press Capacity

Press capacity required for drawing aluminum varies according to alloy, depth of reduction and thickness of material. For example, the following are typical capacities for drawing 3S-O round shells on double-action toggle presses: 125 tons will draw a 14-in. shell, 8½ in. deep of 0.102-in. metal; 350 tons will draw a 25-in. shell, 14½-in. deep in ⅛-in. metal and 500 tons will draw a 37-in. shell, 14-in. deep in ¼-in. metal.

The proper temper of the nonheat-treatable alloys is determined by the article to be drawn. Severe draws require annealed sheet, while less severe draws are possible with intermediate or full hard tempers.

With heat-treatable alloys, severe draws are usually made from annealed sheet. For less severe draws, the sheet may be solution heat-treated and drawn in the as-quenched (W) temper.

Elapsed time between heat treating and drawing should be kept to a minimum or the parts refrigerated, as these alloys age-harden somewhat at room temperature. The maximum strength is then obtained by aging the formed parts at the required temperature and time.

Dies for drawing aluminum alloys are similar to those for other metals, but the designer should take into account differences in the amount of reduction per draw, radii on the dies and change in metal thickness.

During drawing, the metal strain-hardens and changes from the annealed to the harder tempers, with an increase in mechanical properties. It therefore becomes less workable so the reductions per draw in successive draws must be decreased.

For deep-drawn cylindrical shells in alloys 2S-O and 3S-O, the desired reductions in diameter per draw should be 40% for the first draw, 20% for the second draw and 15% for succeeding draws. While these values are not ultimate limits, they should serve as a yardstick.

It is often thought that money for tooling, as well as operations in production, can be saved by using the

upper limits. But operations should not be made too critical, because scrap loss, as well as time lost in production, will quickly exceed tooling savings.

For harder alloys, such as 52S, in which the rate of strain hardening is faster, the percentage reductions may have to be decreased.

The punch radius should be held to a minimum of four times the sheet thickness, while that on the die should be no less than four times and no more than fifteen times the metal thickness. If the radius is too sharp, the resistance to the flow of the metal may cause fractures. If the radius is too large, wrinkling may occur in the side wall of the shell.

Drawing dies should be designed so the original sheet thickness is little changed. This practice differs from that employed on brass and steel sheet, which may be reduced in thickness as much as 50%. It is often necessary, therefore, to redesign dies used for brass and steel when they are to draw aluminum.

In our pressrooms, in the production of various shells for aluminum utensils, barrels and steam-jacketed kettles, draw beads are not used and the surfaces of blankholder and die are kept smooth and highly polished. Alcoa did resort to the use of draw beads a few times during the war, however, when the drawing of some irregularly shaped gun blisters in 24S required considerable stretching of the metal in certain sections.

Drawing Die Materials

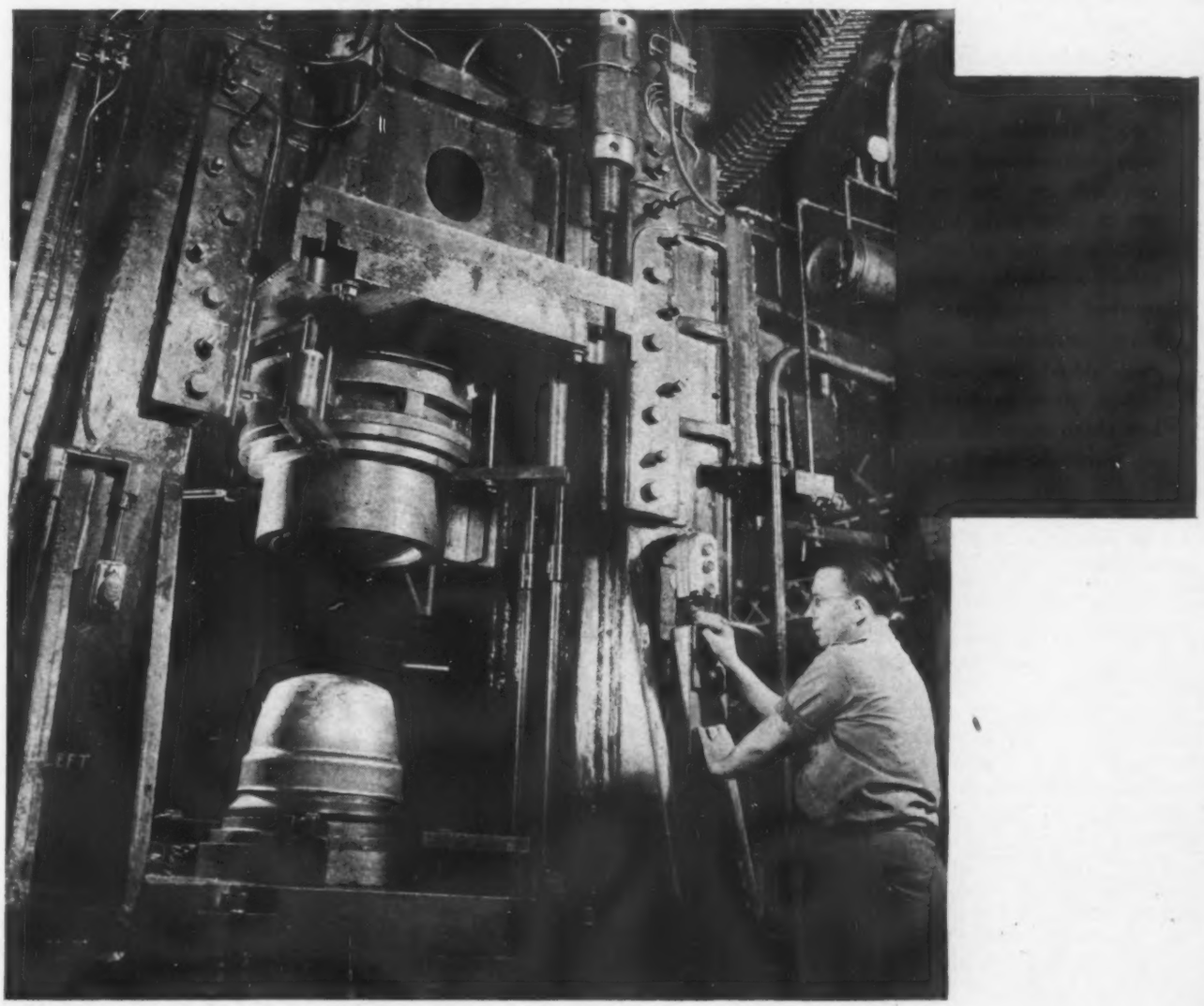
Drawing dies may be made from cast iron, high-grade alloy steel or carbon steel, depending on the type of draw, alloy being formed, final finish desired and part quantity.

Dies of fine-grained cast iron have been widely used for a small number of pieces where it is necessary to keep die costs at a minimum. Cast-iron dies also are well adapted for larger quantities when surface-finish requirements on drawn parts are not exacting.

On large production runs, where the extra cost is justified, high-grade, oil-hardening tool steels give best results, especially for drawing shells from hard alloys and on work where scratches must be kept to a minimum. Intermediate in cost and application between cast iron and tool steels are regular carbon steels, containing 0.6 to 1.10% carbon.

Die finish is an important aspect of drawing aluminum. Dies that are not highly polished have a tendency to pick up an uneven coating of aluminum oxide and flake aluminum, which make proper control of metal flow difficult.

Alcoa has found die finish especially important in the successful, rapid drawing of hundreds of thousands of bottle caps and closures. Customary practice is to draw caps having a depth of 90% of their diameter in 3S-½H metal that ranges in thickness from 0.007 to 0.012 in.



WORKABILITY OF ALUMINUM ALLOYS

ALLOY 2S— *nonheat-treatable, used where high strength not required, strain-hardens slowly with cold work, great reductions possible without intermediate annealing. High ductility permits easy working with hand tools for novelty or gift ware. Principal applications—resist chemical attack or take lustrous finish as in flashlight and headlight reflectors*

ALLOY 3S— *nonheat-treatable, slightly greater strength than 2S but less formability. Used extensively for pots, pans, bottle and jar closures, air-conditioning ducts, flue linings and chemical equipment*

ALLOY 52S—*nonheat-treatable, tensile and yield strengths double those of 3S and less formability in corresponding tempers, high endurance limit and high resistance to salt-water and salt-air corrosion. Retains sufficient ductility for good workability for many drawing operations in ½ H temper and for less severe draws in H temper*

ALLOY 61S— *heat-treatable, moderately high strength, good formability and high corrosion resistance. Alloy 61S-T, with minimum yield of 35,000 psi., is being applied in moving parts in high-speed textile knitting machines, shipping containers, beer barrels, canoes and tubular furniture. Formability of 61S-0 is similar to that of 3S-0, while 61S-W and 61S-T form like 2-H*

ALLOY 24S and ALCLADS 24S, 14S and 75S—*heat-treatable, workable in annealed temper but distortion occurring in heat-treat requires straightening or restriking. These alloys may be formed in W temper before aging as no distortion takes place during aging*

The metal-control surfaces of these dies are nitrided and lapped.

A lubricant for drawing work has two important functions. It allows the blank to slip readily between blankholder and die, and it prevents scratching and galling while this movement takes place. Mineral oils or compounded mineral oils are most often used.

Recommended Lubricants

The following have proved suitable in production operations: light draws—light lubricating oil, medium draws—mixture of light and heavy oils, severe draws—heavy oil or cake of half mutton tallow and half paraffin and more severe draws —less mutton tallow and more paraffin.

Proper choice of lubricant for a particular plant, however, is a matter of experience and depends on the die design, die material and sheet conditions. Cast-iron and low-carbon steel dies require a heavier lubricant to prevent scratching than do hardened steel dies.

Greater reduction per draw, sharper radii and thicker sheet require a heavier lubricant. It is general practice to use mutton tallow and paraffin on thick sheet.

There are other forming operations to which aluminum lends itself exceptionally well. Among these are spinning, stretching, stamping, embossing and coining.

In South America, most cooking utensils are still made by hand spinning, although in the United States spinning has largely been replaced by drawing for quantity production. When tool costs must be kept low or when a product cannot be formed on a draw press because of size or design, spinning is recommended.

An experienced operator can spin articles to reasonably close dimensional accuracy and uniformity in size and appearance. Blanks in thickness from 0.025 to 0.081 in. are usually spun by hand. Metal thicker than 0.081 in. is usually spun by mechanically operated tools.

Area of the starting blank should be equal to surface area of the finished article. As the blank decreases locally in thickness during spinning and therefore increases in area, sufficient excess metal will be available for necessary trimming. Because of this thinning effect, the starting gage must be selected somewhat greater than the final thickness.

The technique of forming aluminum by stretching is well exemplified by the Grumman aluminum canoe. It is formed in two symmetrical halves on a stretch press in alloy 61S-W. Forming by stretching gives aluminum sheet a permanent set by gripping it tightly at the edges while it is being deformed and shaped by action of the punch. This method of forming long sweeping contours, such as canoe halves, where sharp radii are not necessary, means lower tool cost and increased production as compared to toggle-press forming.

Compression Operations

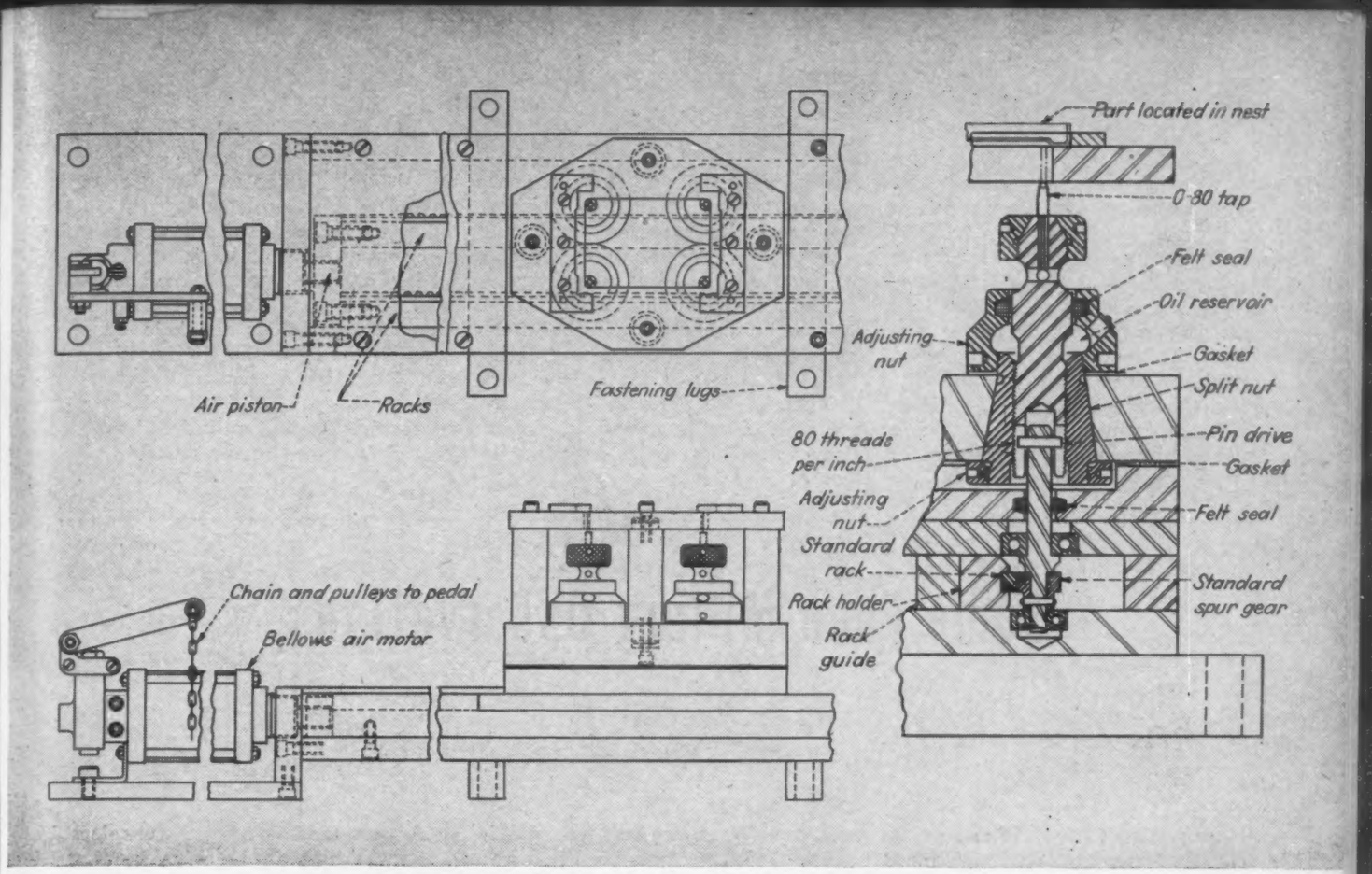
Stamping, embossing and coining, performed in single-action presses with precision dies, are compression operations for strengthening, decorating and marking fabricated articles.

In stamping, the design is stamp-cut into the metal and shows only on one side, leaving the surface otherwise flat. Lettering, figures and the plainest sort of decorations are produced by this method. The design that appears in sharp relief on the end of the punch has narrow rather than broad-faced lines to displace as little metal as possible. A smooth anvil of mild steel supports the work.

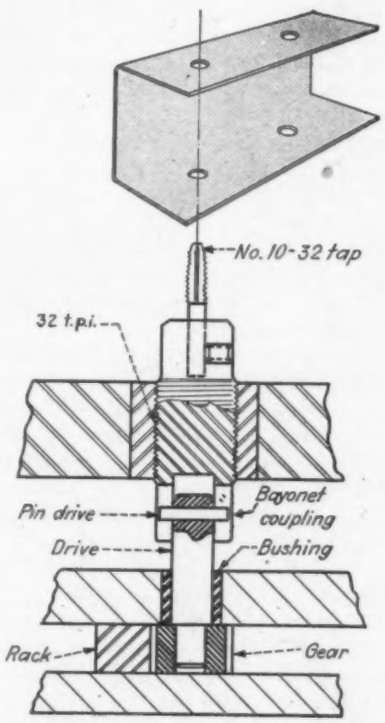
In both embossing and coining, the design is raised on the metal. An embossed design will have rounded edges, while a coined design will show the effect of confining the metal between dies and will have sharp corners and brilliant details.

Knuckle-joint presses provide the steady squeeze needed for embossing and coining. Soft or intermediate tempers of the nonheat-treatable alloys give best results, because the metal must flow under pressure to every nook and corner of the design.

Adapted from a speech delivered before the Toledo District, Pressed Metal Institute.



MULTIPLE-HOLE TAPPING can be effectively done with this air-cylinder driven 4-spindle bench setup. Nesting detail and spindle arrangement can be altered to suit varying requirements. Detail of the spindle indicates that considerable care should be taken in building for high-production purposes. Here again the spindle carrying the gear and tap acts as a leadscrew and a split nut allows for take-up. Lubrication is integral with the spindle



LEADSCREW ACTION is obtained on the drive by matching the spindle and tap threads in this application of tapping on a punch press using the ram action to drive the rack

Single-cycle Tapping Reduces Breakage

BY ED ANDERSON, THE LEE TOOL COMPANY

Rack-and-gear method is basis for high-production tapping on punch presses or straight-line power such as an air cylinder

UNIVERSAL TAPPING of holes can be accomplished by application of the rack-and-gear principle to various types of power mechanisms. This is particularly economical where production is large enough to warrant special tooling to eliminate one or more tapping operations or hold tapping-machine requirements to an absolute minimum.

The method can be applied to punch presses or any other straight-line type of motive power such as air or hydraulic cylinders, which moves the rack forward or backward to turn the gear. Thus, the tap is screwed in and out in one cycle to complete the work.

The spindle which carries the tap should be threaded to whatever thread is being tapped. It then acts as a leadscrew and will produce to a Class 3 fit.

Clips, of various shapes, like those used in the furniture and appliance fields, can be advantageously turned

out by this method. Larger, flat pieces such as instrument panels with numerous holes can best be tapped by using air or hydraulic cylinders. Here, three or four holes of varying size may be tapped in light-gage metal in one cycle.

An effective type of combined operation is the tapping of the clip, shown here, in a progressive die in the same punch press to get a finished piece with every stroke of the machine. This, of course, is most effective where production justifies tooling of a permanent nature and where operations other than tapping are required in the same piece.

Another application shown is the tapping of four 0-80 holes in 0.020-in. aluminum in one 4-sec. cycle. Tap breakage was previously high because of the abrasive and sticky action of aluminum and the small size of the taps. Now, breakage is practically eliminated because of guided taps and good alignment.

Pattern and hole spacing is almost limitless on small holes, where most of the breakage occurs. Any practical number of racks can be hooked on one air cylinder and hole spacing is limited only by the minimum size attainable on a spindle where hole spacing is too close, two or more such tapping units will be required to complete the pattern.

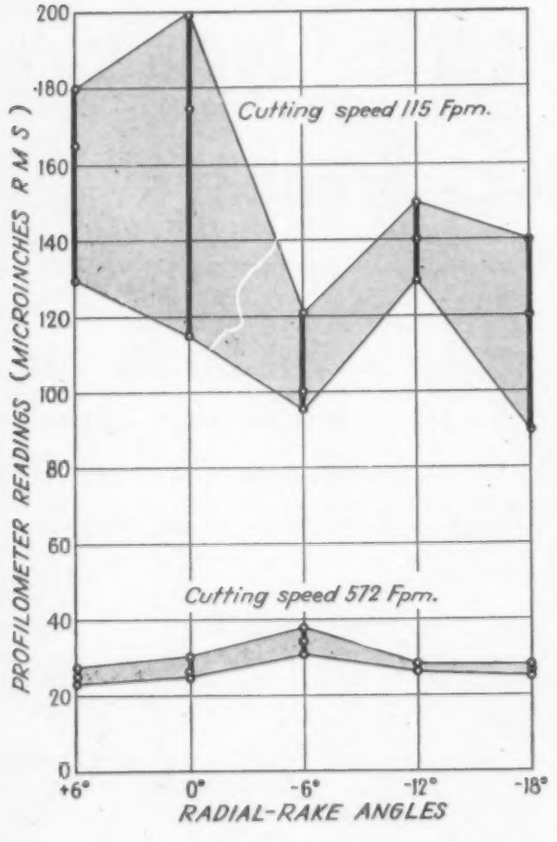
Some Face-Milling Observations

BY A. O. SCHMIDT

RESEARCH ENGINEER, KEARNEY & TRECKER CORPORATION

AS A RESULT of Kearney & Trecker research on high-speed milling, it has been established that cutters with inserted cemented carbide blades at positive radial rake angles, which are provided at the cutting edge with a negative radial rake angle 1½ times the width of feed per tooth, are effective.

The shape and position of the gullet in front of the tooth should guide the chip while the tip is cutting. This prevents curling the chip towards the workpiece, or trapping it, which often causes marred surface finish. When the chips ride around with a milling cutter, smeared or rough spots on the milled surface will appear and tool life will be shortened.



Surface finish readings taken with a Profilometer. Lower part cutting speed 572 fpm., feed 0.010 in. per tooth, depth of cut 0.125 in. Material cut was SAE 1020, normalized, ¾ in. square. Three readings were taken in different places on individual specimens. Upper part represents the surface finish under identical conditions with the exception that cutting speed was 115 fpm.

A poor surface on the workpiece often results from chips getting trapped underneath the cutter in face milling. This can be prevented by having the cutter blades very close to the cutter face, so the chip coming off will not find the opening to slip between the cutter body and workpiece.

Negative axial rake angles often cause surface scratches, as such angles tend to curl the chip towards the workpiece and mark the machined surface. Since a negative axial rake angle will often improve tool life, chip interference can be eliminated by sloping the flute in such a way as to carry the chip away from the machined surface.

If a fine surface finish is desired, feed per tooth and cutting speed should be adjusted as indicated by the following observations of surface in milling operations:

1. Surface finish in face milling is determined less by the radial-rake angle than by the cutting speed and feed per tooth.

2. At the same cutting speed and feed, the surface finish as measured by a profilometer is approximately the same for both negative and positive radial-rake angles.

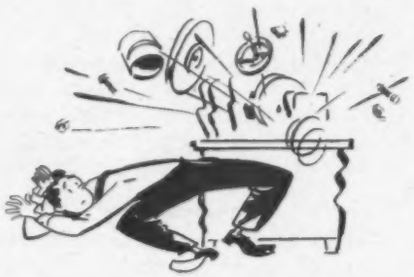
3. The higher the cutting speed and the finer the feed, the better is the surface finish. At too fine a feed and too high a cutting speed, however, the cutter teeth will wear very rapidly.

4. Heavy feeds and slow cutting speeds will result in poorer surface finish.

TALKING SHOP

More Speed

BEARING problems appear to be the major ones in the trend to higher speeds and machine loadings. Present internal-grinder spindle speeds are 100,000 rpm. and better. Shortly builders anticipate double that, eventually half a million. Present research indicates the problem is neither balls nor races, but retainers.



The latter may have to be a high-conductivity metal like silver or aluminum, finned and jet-lubricated. Other engineers guess a sleeve bearing may be the answer—perhaps of carbide. A peculiarity is that wheels breaking at high speed simply fall in pieces—surface speed is up to 6000 fpm. but diameters are so small that centrifugal force is not great. But if a spindle is bent—*duck*.

Turnabout

ONE APPARENT result of wartime subcontracting by machine-tool builders is closer tolerances on postwar products by those selfsame contractors. A second result is business for the machine-tool builders—subcontracting for their former subcontractors.

Men or Machines?

A WARNING, repeated again and again, is never to grind drills, especially larger ones, by hand. The sharpening job done by the average shop man bears out the value of that warning. But a large automotive company tells us that it has discarded its automatic drill-grinding machines in favor of off-hand grinding. In one tool-grinding crib, three men on each shift are kept busy grinding all sizes of drills to gages.

During the war, use of inexperienced workers in slacks required automatic machines, but as soon as experienced grinders were available, out went the machines. Reason—off-hand grinding from 4 to 5 times faster, with as good results in cutting speed and life. Contrasted to this is a battery of automatic face-mill grinders in the same crib, where two men handle eleven machines—the new and the old back to back.

Inked Drawings—Old-Fashioned

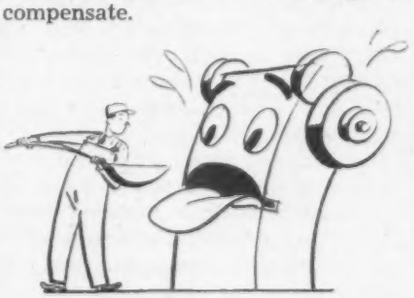
IMPORTANT DRAWINGS were once carefully traced in ink on tracing cloth. In recent years, pencil drawings on tracing paper have satisfied many people, albeit there has been too little care in selecting the proper grade of pencil. Blueprint or diazo print quality has suffered. Now, through photographic processes, it is possible to reproduce good blue, Van Dyck or Ozalid prints from sensitized tracing cloth. The method is: (1) Make the pencil layout on tracing paper, (2) Photograph, (3) Print on sensitized tracing cloth or vellum, (4) Use the cloth tracing for making blueprints. The photographic process will intensify weak lines in pencil tracings, providing a way of revitalizing worn master drawings.

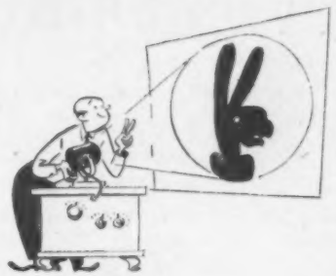
Full Speed—Back

A BIG Cleveland machine-tool dealer is convinced some customers are veering back from highly specialized machines to general-purpose units minus many complicated attachments. One customer, for example, insisted on mechanical feeds rather than hydraulic, manual controls rather than electronic. His reason: His own men could understand and adjust "old-fashioned" tools; saved calling a factory engineer at $50 a day plus expenses.

Castor Oil at Work

BUDD Co., Philadelphia, is using hydrogenated castor oil for deep-drawing stainless. While far more expensive than filled lubricants, it has cut die maintenance and stamping breakage more than enough to compensate.





Bigger & Bigger

JONES & LAMSON is just finishing pilot models for the biggest optical comparator yet, capable of inspecting jet-turbine blades. Contact fingers run over the blade profiles at preselected points, while circles drawn on glass at the opposite ends of the contact arms are projected at ten diameters onto the screen for comparison with master profiles. First trouble is that neither forged nor cast blades come close to desired tolerances. Second is that one aircraft propeller maker has already asked for a machine *twice* as big—to handle work 4x21 in. by 20 ft. long!

Taper by Fluid

TO HONE a small-diameter wire-drawing die, a toolmaker needed a mandrel (to be loaded with diamond dust) with a taper of a tenth of a thousandth, end to end. He got the taper by filling a glass tube with acid, then dipping the mandrel endwise, withdrawing and rinsing. As we recall, the same trick is used to taper wire ends so they can be inserted in drawing dies.

What Would You Do?

A DIEMAKER was enlarging a cored hole in a carbide die insert from 0.023 to 0.039 in. Using a series of tapered laps with diamond dust and oil, he took out about 0.002-0.003 in. per lap. Before long, a lap seized in the hole and broke off. He tried all the tricks of getting it out, but the embedded diamond dust merely made the broken piece stick more obstinately. What would you do?

Benzine Buggy

BACK IN 1880, *American Machinist* described a British-built tricycle driven by a condensing steam engine with "benzoline" as fuel. It weighed 180 lb., traveled 8 mph.

How to Specify

MACHINE TOOLS FOR CARBIDES..2

BY H. A. FROMMELT,
CONSULTING ENGINEER

Selection of machine tools can well be based on consideration of operator, handling means and cubic-inches-per-min. approach

THE APPLICATION of carbide tooling, and specifically carbide milling cutters as far as this discussion extends, has created, with its astronomical increases in feeds and speeds, problems of handling, transfer, fixturizing and loading.

These and related difficulties are so closely associated with the specification of machine tools, sometimes inseparably so, that the fundamental consequences of carbide tooling must be appreciated, by management personnel at least, if grievous errors are to be avoided in the serious responsibility of properly and effectively spending capital funds for truly productive equipment.

Facilities are at this moment on their way to obsolescence because their production activities have not been brought to the level attainable at this stage of our technological development. Others are similarly doomed, not because obsolescent tools have not been replaced but because they are being replaced with erroneously and improperly specified new equipment. It is as damaging to specify new equipment incapable of achieving 1947 levels of productive efficiency as it is not to sweep out the obsolescent at all.

For Certain Failure

An automotive cylinder head and block line is now being set up and tooled. The machines to mill the cylinder block ends are specified and built with 15-hp. motors. To make certain of failure the machines are specified as drum type.

A quick evaluation of this operation, in terms of carbide mills of latest design and the amount of cast iron that can be moved in cubic inches per minute, results in the conclusion that 100 cu. in. of metal can be milled off each minute.

As the longest dimension of the cut is 9 in. and maximum depth of stock is 0.250 in., it is simply and easily calculated that the feed rate can be specified as 50 ipm. The operation has been performed experimentally at this table feed with satisfactory results. As all automotive cylinder-block material specifications are similar, as regards to such characteristics as Brinell hardness (190 to 220) and composition, these experimental results can logically be transferred to any production line.

If 100 cu. in. are to be removed with any sense of security, a 50-hp. spindle drive should be specified for the operation. The 15-hp. drive being supplied limits the feed rate to 15 ipm. In an emergency it can be raised to 20 ipm., but for continuous operation and without too frequent replacement of just slightly dulled cutters, the 15-ipm. rate must be established as standard.

The cutting cycle therefore is three times longer than it need be, indeed than it can afford to be, with present methods of metal removal. When stock can be moved at 100 cu. in. per min. but is restricted to 30 because of incompetence, that facility cannot tolerate many more such exhibitions of bungling.

Compounded Errors

But the error is being compounded, and more, by specifying a drum-type milling machine for the job of machining the block ends. If the basic characteristics of carbide milling and machining were clearly understood and appreciated, such an error would never have been committed. Yet incredibly enough, carbide milling cutters are added to the tooling specification.

Both drum and rotary-table machines have given excellent service in milling with high-speed steel. The top feed rate from a loading and unloading aspect, however, is not more than 15 ipm. and probably closer to 10 ipm. It is impossible, regardless of the method of clamping on the drum periphery or table, whether manual or mechanical, to load and unload at a higher rate.

Moreover, even at these lower rates of feed, these machines always required far more back-breaking effort than is necessary, or should be expected of operators. It is time that managements and machine-tool designers consider the operator, still of supreme importance in this age of labor-saving devices.

Transfer Machines Reduce Effort

The transfer type of machine is ideally suited for this and similar operations. The component is brought without benefit of strong back to the stationary table and clamped automatically by either hydraulic or pneumatic means. The traveling head with cutter passes by the workpiece, which is then released automatically and finally moved on with a minimum of effort from operator or helper.

The drum or rotary-table type, regardless of the kind of handling equipment bringing the workpieces to the machine, demands some lifting, shoving and maneuvering.

It is certain from experimental results that the head side of automotive cylinder block can be milled at rates as high as 90 ipm. The resulting and inescapable break-out of the leaving edge is not a disadvantage, as this is subsequently removed when the cylinders are bored.

But only a properly designed piece of equipment from the handling standpoint could possibly justify the application of carbide at these high rates. In fact, such rates would be useless unless components can be brought to and taken from the milling operation quickly and easily by the operator.

But selection of proper equipment must be made with full appreciation of the fact that machining of material begins with the workpiece and its ability to stand up under the cut. This establishes the rate of table feed.

If this approach results in a feed rate higher than the present handling equipment, machine design or both justify, then both factors must be critically examined. And it must be made unmistakably clear to the machine-tool builder that operators are to be given first consideration.

These considerations are only too frequently disregarded. This, in the end, restricts the use of the machine to its fullest and therefore does not permit taking full advantage of a carbide conversion. If components cannot be loaded and unloaded at the rate of feed designed into the machine, then either the rate is lowered or additional manpower is added. Either way, the loss is reflected in lowered productivity.

Loading and Unloading Cycles

The cubic-inches-per-minute approach to machine-tool specifications (milling, specifically) leads, therefore, not only to a consideration of the machine itself as a part of the handling equipment but also to the fixture. The former automatically eliminates certain types, such as the drum and rotary table, that inherently do not lend themselves to bringing the loading and unloading cycles into proper and proportionate relationship to the cutting cycle without addition of manpower, degradation of the operator or both.

Conversion to carbide on existing equipment designed for lower bracket speeds and feeds results in nothing more than disappointment, chagrin and, in the end, mounting prejudices against carbide which years of intensive effort may be required to eradicate.

To specify new equipment, with no appreciation of the revolution that has taken place in metal removal, may result in obtaining only a few of the advantages of carbide, because of restrictions imposed by handling and limitations imposed on the operator's efforts by improper machine-tool and fixture design.

Automotive Industry Backward

The automotive industry is a glaring example of poor machine-tool and fixture design. Carbides have been applied and are being used on equipment entirely unsuitable for the higher feeds and speeds and with fixtures conceived during the era of 50- to 75-sfpm. cutting speed. Furthermore, an incredible amount of machining is still ground out at the old rates in spite of 20 years of availability of tungsten carbide.

A survey indicates that in no instance is automotive power-plant material being removed at the top rates now justified by the cubic-inches-per-minute approach. At least 25% is still being removed at rates in vogue prior to 1927, and the remaning 75% is being removed with carbide but at less than 30% of the top metal-removal rate possible today. And this is considered the best sector of American industry!

A manufacturer of engineering equipment of wide scope and variety has proved that it is possible, using present equipment wisely after restudying operations and renovating handling cycles and equipment, to increase manhour productivity by 50% and as much as 75% on properly engineered and specified machine tools equipped with carbide.

What this means is difficult to comprehend in terms of economy percentages. The ratio of machining time to total time varies from industry to industry. In the general engineering equipment and manufacturing field, surveys indicate variations from 50 to 80%.

The remaining manhours are devoted to such operations as welding, bench work, assembly and testing, all of which cannot be affected appreciably. Economies so desperately needed to permit high wages and an attractive price level can only be made by intelligent use and application of carbide and, above all, by correct specification and purchase of tools and tooling.

Productivity Increased

A facility employing 1,000 operators can increase the productivity of the one-half employed in machining operations. Thus, 80,000 of the 160,000 manhours per month becomes the objective of the new technique.

Application of carbide to existing equipment, in spite of all its limitations, will result in an average increase in productivity of 25% and with new equipment, properly specified and correctly tooled and fixturized, as much as 75%. The present volume of production will be delivered at a saving of 20,000 manhours for partial conversion, 60,000 for a complete and fully rounded program, and on a sliding scale basis between these two depending on the rate of the conversion.

The worst offenders in milling practice are special and improper cutters. The slab mill, for example, has little or no reason for existence. Its work can be done better and more economically with a face mill, except in unusual and rare instances. This cutter, as compared with a face mill, is expensive in its first cost and in its reconditioning, usually costing three to four times as much and requiring 4 hr. for grinding to every one for the face mill. Moreover, it is necessarily operated at a slower rate and results in surface conditions and tolerances far inferior to other mills.

Spindle Mounting Preferred

Straddle mills are on the way out with the introduction of carbide. The temptation to mill two surfaces at one pass must be overcome in favor of the simpler, less expensive and far more economical milling of one surface at a time but at rates 4 to 10 times faster than was possible with straddle milling.

These setups require two cutters, half-side mills, assembled on an arbor and in correct dimensional relationship to the workpiece. An arbor assembly is never as rigid as a spindle-mounted cutter and the work of setting straddle mills correctly in relation to the workpiece is most expensive and time-consuming. With carbide, one side is milled at a pass with a standard cutter, quickly and easily placed on the spindle, and at rates many times faster.

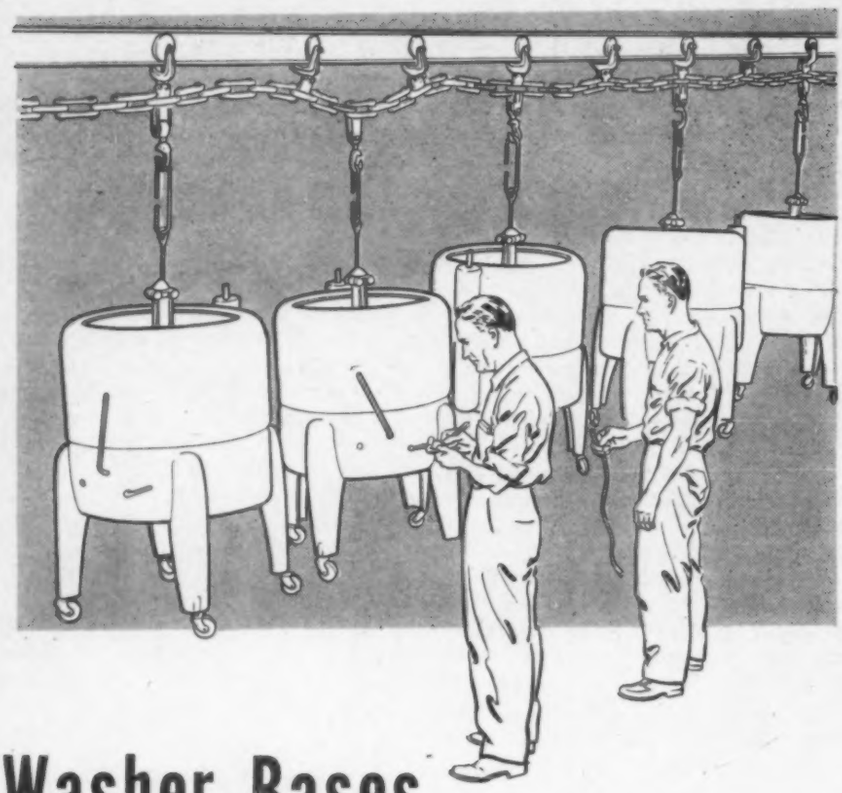
This practice, for the same reasons, is also making obsolete the use of gang cutters. Such cutters are of special design, expensive, costly to recondition, and can never be operated efficiently. The time required to assemble a gang of cutters is out of reasonable proportion to the carbide cutting cycle.

If an operation is broken down into several or more passes, each one taken at the highest rate permissible with carbide and the available equipment, the "floor-to-floor" time is drastically reduced, the operation is executed with standard cutters, the reconditioning cost of which is only a fraction of that for gang cutters.

Jobs, machine tools and fixtures must be re-studied in the light of a technique of metal removal that has completely revolutionized manufacturing. This technique does not merely involve carbide application.

It involves, above all, the proper use of reconditioned existing equipment, correct specification of new machine tools solely on the basis of the number of cubic inches of metal that can be removed from the scheduled workpieces and, finally, engineering the handling to the cutting cycle to bring these two into proper relationship.

The concluding part of this series will be published in an early issue.



Washer Bases Fabricated from Sheet

Presses and welder group make 1800 bases a day. Excess capacity permits die changes without halting main line

BY KENNETH F. BROOKS

MASTER MECHANIC, NINETEEN HUNDRED CORPORATION

MASS-PRODUCTION manufacture of domestic washing machines and ironers means, in addition to a fully conveyorized final-assembly line, individual lines for component parts and subassemblies that feed the final-assembly conveyor at the most convenient points. Many of these subassembly and parts lines also are conveyorized. Even in the machine shop and press rooms, production equipment wherever possible is grouped so parts can be moved without shop trucks.

Of special interest is a group of presses and resistance welders set up adjacent to the final-assembly conveyor and manufacturing base subassemblies for several types of washing machines. This group has capacity for more than 1,800 complete base units each 8-hr. shift, slightly in excess of normal capacity of the final-assembly line, so production of bases can be kept ahead of requirements and still allow time for change of models. Such changeovers occur two to three times a day now because of material shortages.

Tools in the base subassembly line have been designed for rapid model changeovers. Under present conditions, only 1 to 1½ hr. is required for a complete change of tools from one model to another. (Of course, a changeover does not always mean changing all tools.)

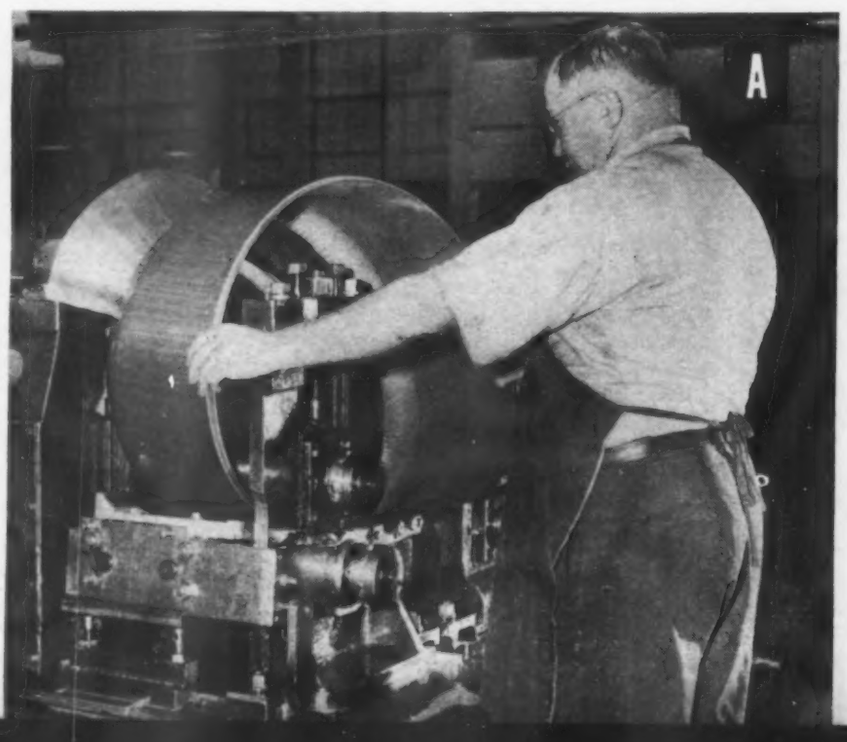
The average base rim produced measures 23 in. dia. and 10⅞ in. high. It is formed from 0.045-in. sheet steel, the four legs from 0.051- to 0.056-in. sheet steel. Only the base rim is produced from sheet stock within the base subassembly group. Other parts, including complete leg subassemblies, baseplates, motor-mounting brackets, etc., are produced in nearby lines.

Operations in the base line are:

1. Roll shear sheet steel to proper width for forming the base rim. Sheet stock is delivered by gravity roller conveyor from the steel storage area to the Bliss roll shear at the starting end of the line.

2. Shear strips to length in a single-crank punch press having a feed table equipped with end and side stops. Two standard strips are required for the several models of washing machines manufactured. They are 9 1/16 x 72 1/2 in. and 11 1/16 x 72 1/2 in.

3. Roll form base rim in 15-hp. McKay three-stand roll forming machine **(photo A)**. Two operators are required, one to feed the strips into



the end of the machine and the second to remove formed rings from the other end. A guide plate over the final roll stand guides the forward end of the formed ring so it will not catch and be bent. (The same machine forms top shells)

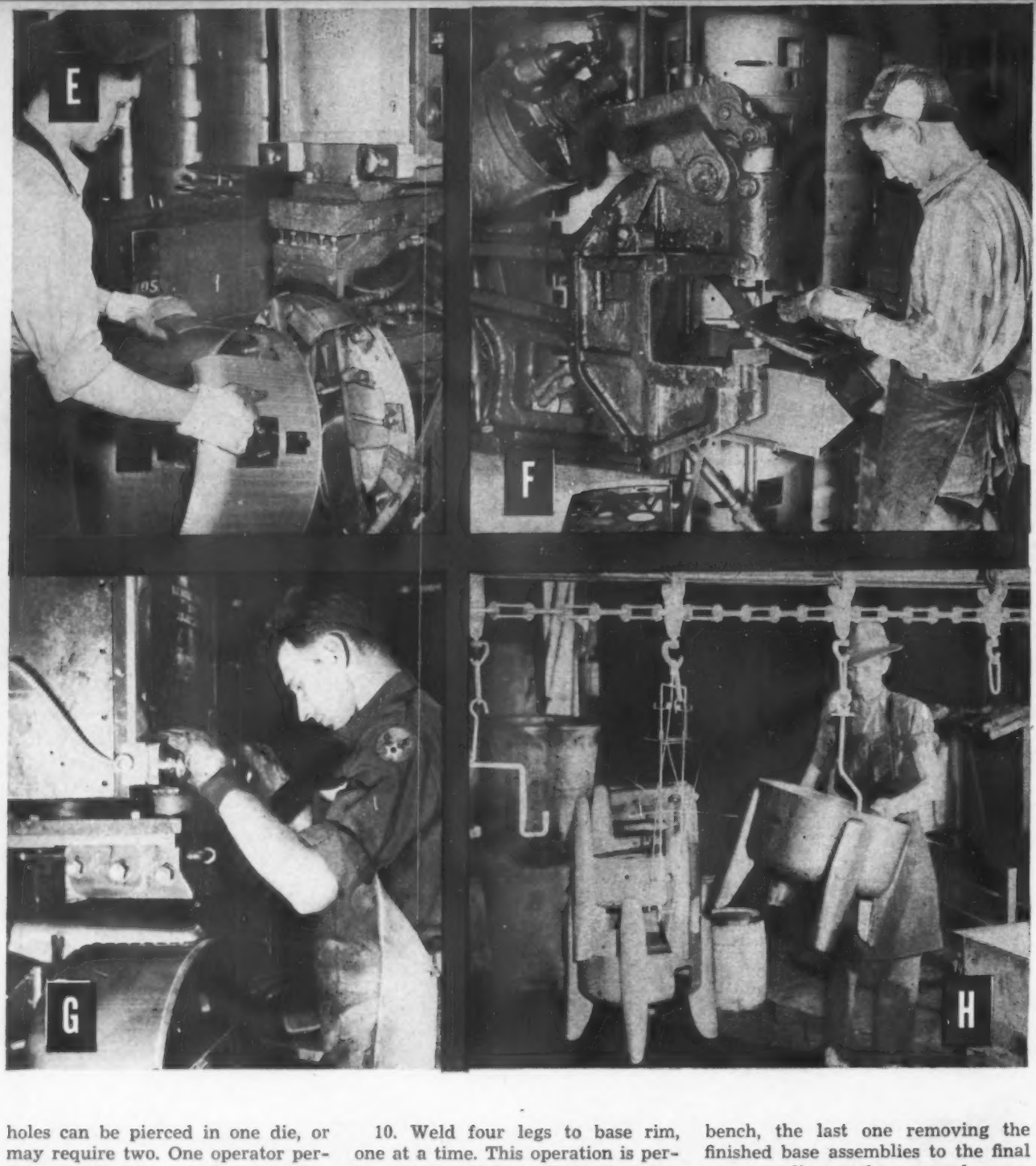
4. Trim ends of rim for welding operations in a No. 24 Bliss-Consolidated horn press equipped with a special workholding device (**photo B**). Operation of the clamping ring is interlocked with actuation of the press clutch, so the operator has only to step on the pedal of the valve controlling the pneumatic clamping cylinders. When the piece has been locked in position, an interlock valve admits air to a third cylinder which trips the clutch of the press automatically. The clamping device must be kept in adjustment so that it will hold the base rim tightly against the horn of the press, thus assuring accuracy.

5. Join ends of rim in a Federal 125-kva. resistance welder by projection welding a 3 x 2-in. square steel plate inside the rim across the butted ends (**photo C**). This plate has six 3/16-in. dia., 1/32-in. high projections formed in a 1 9/16-in. dia. circle in a dimpling operation. Jaws of this resistance welder locate and clamp ends of the rim together before welding.

6. Pierce, one at a time, the four leg cutouts in the base rim (left, **photo D**). These cutouts are spaced 90° around the rim and pierced from the rim with dies mounted in a No. 24 Bliss-Consolidated horn press. The first cutout is located by bringing the welded joint of the rim in line with a marker. Then, each of the three succeeding cutouts is located by bringing the previously sheared cutout against a stop pin in the die assembly.

7. Pierce hole for drain plug in side of rim, using dies set up in a similar horn press (center, **photo D**).

8. Pierce holes for timer control, shifter lever and pump control rod in one or two operations, using similar horn presses (right, **photo D**). Depending on spacing of the holes around the base rim, which differs from the different models of washing machines produced, these



holes can be pierced in one die, or may require two. One operator performs both this and the preceding operation, moving the part from press to press until completed.

9. Resistance-weld baseplate into rim, using a Federal 200-kva. welder (**photo E**). The baseplate, finished in a separate line, previously has had two cold-rolled steel studs riveted in position at a 50-ton air press installed near this welder (**photo F**). The baseplate has eight 3/16-in. dia. and 1/32-in. high dimples formed in each of the two flanged sides for projection welding. Two machines are needed in the line. Fixture is designed so operator can mount the baseplate in position, then place the base rim over it before welding. Two welds are made, one on each side of the rim, to join both ends of the plate to the rim.

10. Weld four legs to base rim, one at a time. This operation is performed in 300-kva. Federal resistance welder (**photo G**). Each leg has 18 projection lugs cut in the joint sides, 9 per side, formed earlier in a trimming operation. A rotating fixture holds the base assembly on the welder, so it can be indexed 90° between welds. Six of these welding machines are needed to balance the line. Several times a day operators of these leg-welding machines use steel bars to tear all four legs from a base assembly in order to test the quality of the leg welds. Variations in material have been found to make changes in settings of the welding machines necessary to insure maintenance of weld quality.

11. Deliver base assemblies to bench line where motor brackets are fitted. Three operators work at this bench, the last one removing the finished base assemblies to the final conveyor line as the proper hangers pass his position (**photo H**). The conveyor delivers them to bonderizing and spray-painting booths for finishing before final assembly is started. Overflow from the base subassembly line goes to a storage conveyor until needed on the final-assembly conveyor.

In order to get an accurate count of production in the base line, each press and welding machine has a counter connected to a moving member. Final count of bases delivered from the line is obtained from a counter tripped by the bench operator each time he delivers a base.

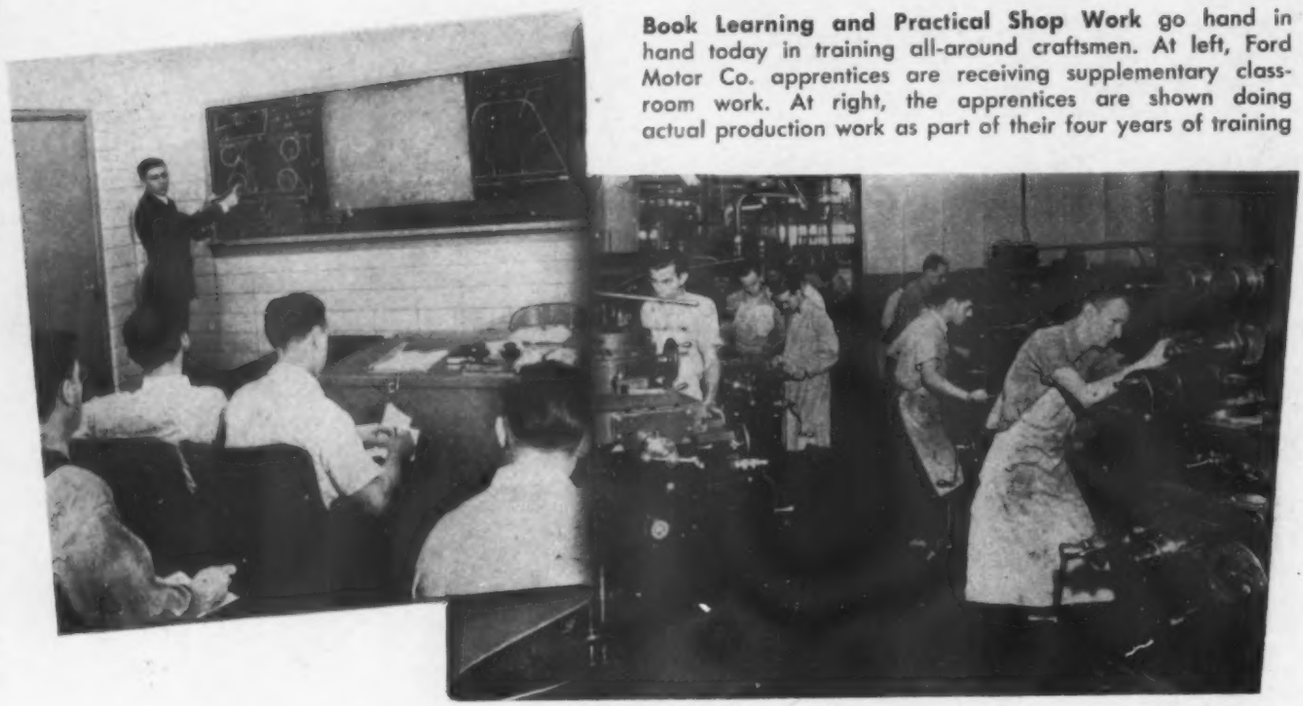
An overhead storage conveyor is provided in this group to take any overflow of base subassemblies when model changes are made.

APPRENTICE TRAINING

assures a reservoir of skilled craftsmen

By HARRY J. WILLIAMS, ASSOCIATE EDITOR

CRAFTSMEN are made, not born. Natural aptitude is, of course, a prerequisite to craftsmanship, but in the final analysis, the type of training received during apprenticeship determines the skill and quality of tomorrow's craftsmen. No industrial plant, regardless of size, can afford to shrug off the known values of apprentice training. Many companies have chalked up commendable records of apprentice-training achievement; many of the nation's foremost industrialists reached their pinnacles from the bottom rung of apprenticeship. Too many companies, however, can claim no credit for adding to the necessary reservoir of skilled mechanics. They persist in drawing skilled manpower from "open markets," reaping the training benefits from bills footed by other companies. The task of training machinists and tool and die makers is the obligation of industry generally, not just of individual segments.



Book Learning and Practical Shop Work go hand in hand today in training all-around craftsmen. At left, Ford Motor Co. apprentices are receiving supplementary classroom work. At right, the apprentices are shown doing actual production work as part of their four years of training

Modern Methods of Apprentice Training

MODERN APPRENTICESHIP is no "hit-or-miss" proposition. It is carried on today with the same care and detail that goes into college curricula. Concepts of it as a "necessary evil" are outmoded. Foremen, supervisors, and top executives of countless companies represent proof-positive of the value of apprentice investment.

This report is concerned chiefly with full apprenticeship for prospective all-around machinists and tool and die makers. There is a vast difference between all-around machinists and operators of specific machine tools, such as lathes and grinders. The latter are often referred to as "specialists," yet the title is misapplied unless they have first been grounded in all phases of machine-shop skills.

The need for training all-around mechanics cannot be over-emphasized. Reports from industrial centers throughout the country stress the dearth of skilled machinists and tool and die makers. The reason for the shortage is no secret. It resolves itself into a plain set of economic facts.

During prosperous production times, this nation has always turned its attention to apprenticeship—the method for training qualified journeymen. When demand tapers off and economic slumps roll around, training programs suffer.

Today's shortage of qualified journeymen can be traced in the main to curtailed training programs of the depression years. The number of new men entering the metalworking field through apprenticeship during those years failed to keep pace with the death and retirement of skilled workers.

Industry can only look to itself for providing the necessary craftsmen of the future. It is mandatory that all segments of metalworking industries realize this obligation. It is a trade wherein practical shop training is basic and theory or related training broadens the learner's knowledge.

Government's Interest

The Federal Government's awareness of the importance of apprenticeship is attested to by operations of the Apprentice-Training Service, U. S. Department of Labor, which has made great strides in stressing the value of formalized apprentice-training courses in industry. Further governmental cognizance of this important task is reflected by activities of the Trade and Industrial Education Service, Vocational Education Division of the U. S. Office of Education, and the American Vocational Association.

With regional offices throughout the country, the Apprentice-Training Service has guided and assisted in the establishment of numerous formalized apprentice programs. It has prepared a system of apprentice indenture effective for large and small plants alike. The Service's representatives are familiar with industry and hold themselves in readiness to assist in the establishment of new apprentice programs and to afford guidance in ironing out problems arising in programs underway.

Return of thousands upon thousands of veterans to peacetime livelihoods has been smoothed in large measure by apprenticeship. While they have raised the age limits for apprenticeship, former servicemen have presented excellent material for trade training. Financially, the rate for apprentices has risen, and in addition veterans are entitled to subsistence allowances during the course of their training.

Subsistence allowances paid the veteran under the GI Bill of Rights plus wages paid by the employer permit veterans with domestic responsibilities to enter apprenticeship. Veterans today represent a sizable portion of apprentices in training. Many received mechanical training in the armed services. This training increased their mechanical apti-

tude and, beyond that, helped to crystallize their thinking on the post-war benefits of being craftsmen.

Beneficial Refinements

Modern apprenticeship incorporates many of the basic training techniques used down through the years. Beneficial refinements have been added, however, so that today's apprentice is entitled to respect and understanding—he is not a "chore boy" learning a trade in "catch as catch can" fashion.

Formal apprentice programs are replacing the old method of just "taking on" a lad and letting him pick up what he can in shop atmosphere. Full four-year courses have been established with set hours of related training. Most recognized courses—particularly those registered with Federal or State agencies—are of the same pattern, except for comparatively minor differences for various sections of the country.

The courses hold as true for training a man in a shop employing ten men as in plants operating with hundreds of craftsmen. Certain fundamental standards have become recognized for qualified machinists, and tool and die makers. A man failing to meet these standards by virtue of insufficient training opportunities will be handicapped.

The movement for ever-better training of apprentices has provoked new industrial considerations. Thought, study and planning on the part of executives are as necessary in formulating an apprentice program as in launching a new product. If apprenticeship is worth installing, it is worth operating efficiently.

Instruction Considerations

Type of instruction is not difficult to arrive at. Methods of instruction foment a major stumbling block. For upon the shoulders of men chosen to teach apprentices rests the success or failure of any program.

Instruction cannot be delegated haphazardly. The trainers must have attributes of sincerity, patience, understanding, and full knowledge of the responsibility vested in their hands. They must be sincerely interested in an apprentice's progress. They cannot afford to hold back "trade secrets." Indifference and casual guidance will be mirrored in the apprentice's attitude. Just as a precision part must be machined to fine tolerances, so must an apprentice

Apprenticeship Is Indispensable

WILLIAM F. PATTERSON
DIRECTOR, APPRENTICE-TRAINING SERVICE
U. S. DEPARTMENT OF LABOR

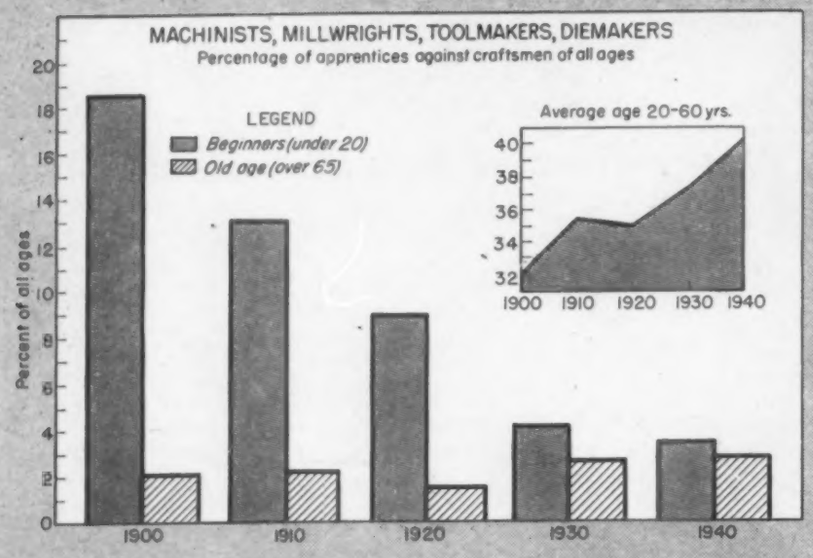
TODAY more than ever before, thorough, all-around training as provided by apprenticeship is indispensable in assuring the skills and versatility necessary for craftsmanship in the metalworking industry. Not only is it of the utmost importance to build up the ranks of skilled workers through this training, but the work performed in the industry is becoming increasingly intricate, requiring more intensive, comprehensive training.

The metalworking industry is faced with an enormous task in building and modernizing the nation's production machinery; and the training of the men who build and maintain the machines must be conducted according to the most modern methods—methods which must be in tune with engineering advancement and manufacturing improvements.

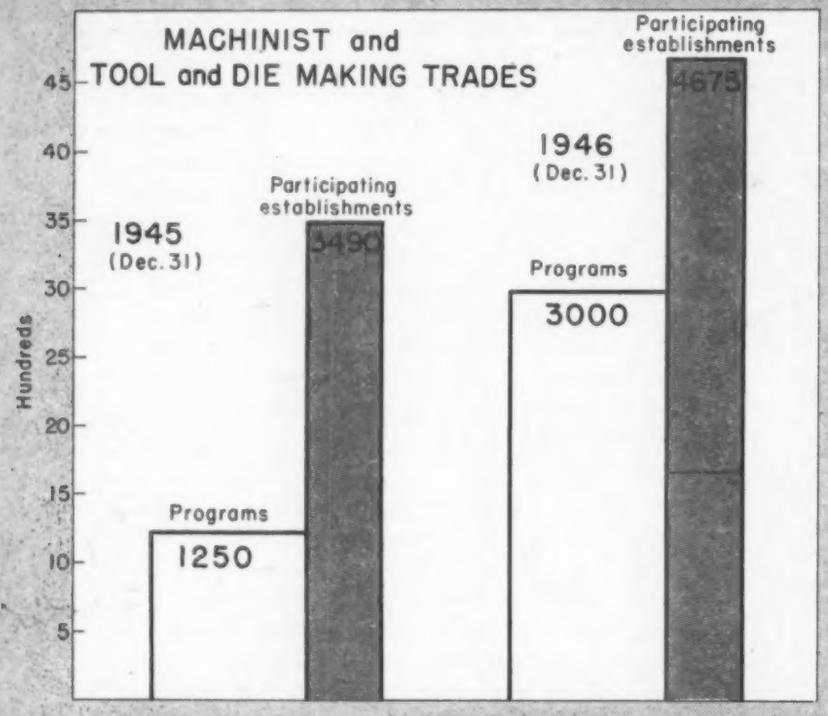
America's capacity for industrial achievement, its genius for production and quality workmanship depends very largely upon the skills of its craftsmen—the all-around skilled workers. The mechanical engineer depends upon the skilled mechanic to produce the machines in accordance with specifications, just as the mechanic depends upon the engineer to specify how the machines are to be made.

From the ranks of the skilled workers are drawn most of the men who must shoulder the major responsibilities in the plants and shops throughout the country—foremen, supervisors, production managers, and top-ranking executives. And it is only through carefully planned, adequate apprentice training, based on time-tested standards determined by management and labor, that young men entering the skilled trades can acquire the skills required for true craftsmanship.

In order to keep apprentice-training practices in keeping with current industrial changes, the metalworking industry must be on the alert. Those concerned with training must keep informed on the methods and procedures adopted in the various plants and shops throughout the industry. The vast store of information included in the following pages should be of immense value to those engaged in the industry in every part of the United States, in planning and conducting apprenticeship programs. In compiling this comprehensive data, the editors of AMERICAN MACHINIST are meeting a long-felt need.



Trends Show Need for Training — This chart, based on U.S. Census figures, shows we are training too few apprentices as machinists to replace craftsmen who die or retire before the age of 65. Replacements (apprentices and workers under 20 years of age) dropped off from 18.6% in 1900 to 3.4% in 1940. In 1900, the beginning group was nine times as large as the old-age group; in 1940 the two groups were almost of equal size. If the trend continues, the beginning group would be too small to replace even the old-age group. It is estimated that 50,000 apprentices should be undergoing training each year



Apprentice Programs Increase — The Federal Apprentice-Training Service reports the number of apprenticeship programs registered with it more than doubled in 1946 over the preceding year. There were 1,250 programs representing 3,490 companies registered in 1945. The number of programs increased to 3,000 in 1946 with 4,675 participating establishments. In the latter bracket, 1,675 participating establishments are in area-wide programs with joint committees. Of the remaining number, 530 operate individual programs with joint committees; the remainder are without joint committees

be trained competently into a craftsman.

This doesn't mean that companies must go outside their own walls to obtain instructors. Many competent craftsmen can be given instructor training by state departments of vocational education. It is true that many competent craftsmen would make poor teachers because they just can't put their points across. But even in the smallest shop there usually can be found one journeyman who can handle apprentice training with the supervisor's cooperation.

Aside from learning mechanical skill, an apprentice today should become versed in the rudiments of safety; in cleanliness, including personal habits and good shopkeeping; in the value of machines, tools and instruments; in making every effort to avoid waste; and in the tenets of good citizenship. Instructors don't have to be extreme moralists or anything approaching it, but they should set good examples.

In establishing new programs and in operating courses, companies might well confer with their full-time employees from time to time in the matter of complaints. It is only logical that apprentices will have questions placed in their minds if they hear older craftsmen "griping" about their lot. This enters the realm of good management-employee relations, but remains a worthwhile consideration.

Cost Considerations

It is difficult to measure the cost of apprentice training in dollars. Those who think of it as a philanthropy are dead wrong. There is nothing charitable about instituting an apprentice-training program. Rather, it is a long-range investment capable of returning substantial benefits. Charges that apprentices cannot warrant their cost for at least two years are open to question. In the first place, apprenticeship can only be considered in the light of long-range planning.

Most companies sponsoring apprentice courses find ready berths for graduates in their own plants. They replace men lost through death, retirement or for other reasons. The advantage from a company standpoint is obvious. It not only secures a skilled craftsman, but has an employee versed in its operations and policies. These same men will likely strive to become the foremen, supervisors and top executives in the years ahead. These are possibilities

that defy plain monetary values.

Experience records show that the good-will of an employer toward apprentices in his plant affords a real incentive. In smaller plants, the boss is closer to his men. In larger plants, top management has made a point of letting its interest communicate to the apprentices.

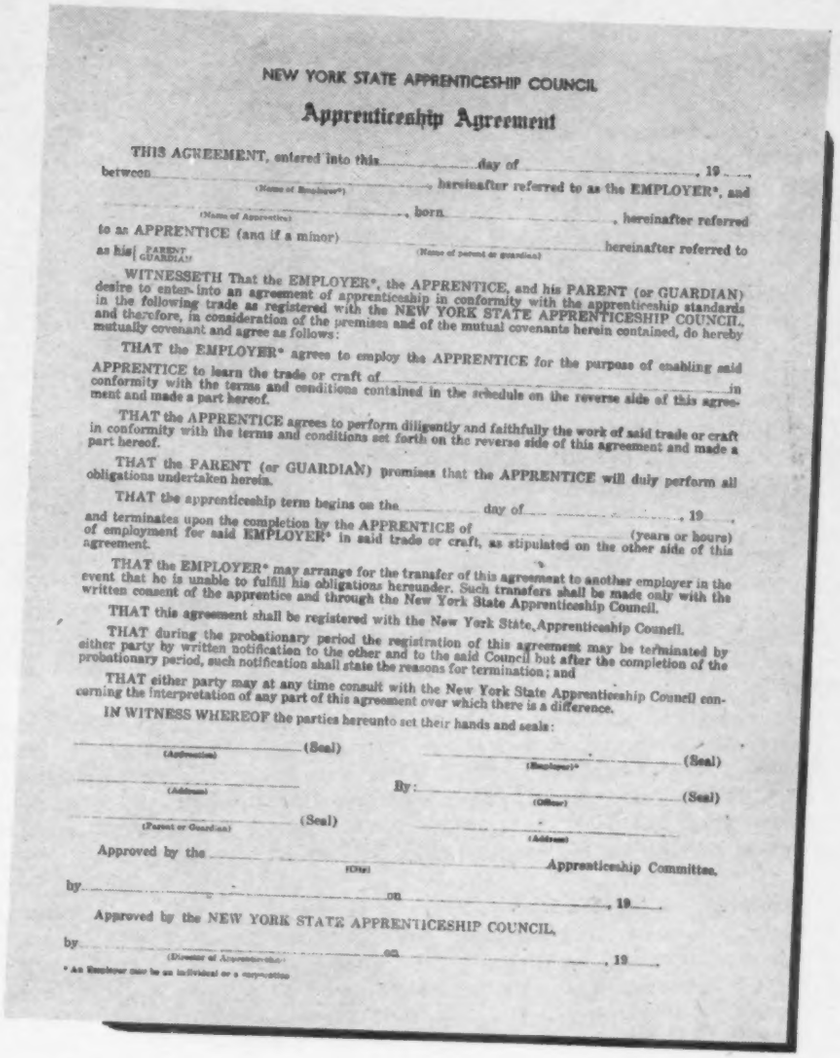
Making Apprenticeship Appealing

The end of the war brought a tremendous upsurge in apprenticeship. Production headaches of the early postwar era, however, have militated against many companies organizing or reinstating apprentice courses. It is estimated today that 85% of the nation's apprentices are veterans, with thousands more clamoring for apprenticeship openings.

It is only natural that veterans are entitled to a degree of preference in seeking apprenticeship. But the present heavy reservoir of apprentice material does not lessen the need for industry do all in its power to make apprenticeship attractive.

Each year our high schools turn out young men unable to go to college. Unless the doors of apprenticeship are open, they will turn to other pursuits. Much useful machinery is operating at present to make apprenticeship appealing. This program should continue unabated in the years ahead. Only in this way can industry spare itself from a thin market in craftsmen.

The advantage of craftsmanship must be carried to parents. They must be impressed with the benefits their sons can reap from entering the door of industry through scientific apprenticeship. The parents' signature is required on the indentures of minors.



NEW YORK STATE APPRENTICESHIP COUNCIL

Apprenticeship Agreement

THIS AGREEMENT, entered into this ..... day of ....., 19....,
between ..... (Name of Employer*), hereinafter referred to as the EMPLOYER*, and
..... (Name of Apprentice), born ....., hereinafter referred
to as an APPRENTICE (and if a minor) ..... (Name of parent or guardian) hereinafter referred to
as his [PARENT / GUARDIAN]

WITNESSETH That the EMPLOYER*, the APPRENTICE, and his PARENT (or GUARDIAN) desire to enter into an agreement of apprenticeship in conformity with the apprenticeship standards in the following trade as registered with the NEW YORK STATE APPRENTICESHIP COUNCIL, and therefore, in consideration of the premises and of the mutual covenants herein contained, do hereby mutually covenant and agree as follows:

THAT the EMPLOYER* agrees to employ the APPRENTICE for the purpose of enabling said APPRENTICE to learn the trade or craft of ..... in conformity with the terms and conditions contained in the schedule on the reverse side of this agreement and made a part hereof.

THAT the APPRENTICE agrees to perform diligently and faithfully the work of said trade or craft in conformity with the terms and conditions set forth on the reverse side of this agreement and made a part hereof.

THAT the PARENT (or GUARDIAN) promises that the APPRENTICE will duly perform all obligations undertaken herein.

THAT the apprenticeship term begins on the ..... day of ....., 19....,
and terminates upon the completion by the APPRENTICE of ..... (years or hours)
of employment for said EMPLOYER* in said trade or craft, as stipulated on the other side of this agreement.

THAT the EMPLOYER* may arrange for the transfer of this agreement to another employer in the event that he is unable to fulfill his obligations hereunder. Such transfers shall be made only with the written consent of the apprentice and through the New York State Apprenticeship Council.

THAT this agreement shall be registered with the New York State Apprenticeship Council.

THAT during the probationary period the registration of this agreement may be terminated by either party by written notification to the other and to the said Council but after the completion of the probationary period, such notification shall state the reasons for termination; and

THAT either party may at any time consult with the New York State Apprenticeship Council concerning the interpretation of any part of this agreement over which there is a difference.

IN WITNESS WHEREOF the parties hereunto set their hands and seals:

..... (Seal) ..... (Seal)
(Address) (Employer)*

..... By: ..... (Seal)
(Address) (Officer)

..... (Seal) .....
(Parent or Guardian) (Address)

Approved by the ..... Apprenticeship Committee,
(City)
by ..... on ....., 19....

Approved by the NEW YORK STATE APPRENTICESHIP COUNCIL,
by ..... on ....., 19....
(Director of Apprenticeship)

* An Employer may be an individual or a corporation

State Apprenticeship Councils provide forms such as this for written agreements in apprentice-training programs. Regardless of whether the company is small or large, written agreements are recommended because they set forth clear-cut issues for both the company and the apprentice to abide by. On the back of the form, space is provided for classifying major work processes, graduated wage scales, related training hours

Labor Endorses Apprenticeship

Labor organizations recognize the need for apprenticeship and have cooperated in the preparation of apprenticeship standards. It is important that the apprentice have the interest and good will of labor. Some labor organizations have placed restrictions on the number of apprentices that can be trained as all-around machinists or tool and die makers. They base their action on a desire to see that the trade isn't glutted. As a rule, the restrictions represent the ratio of apprentices to journeymen in a company. The ratios range from one apprentice to from five to ten journeymen.

The attitude of one labor organization, the International Association of Machinists, was summed up by its president, H. W. Brown, in taking issue with a newspaper which had implied apprenticeship had been outmoded by important advancements in training workers for specific jobs. Excerpts of Mr. Brown's statement:

"As industry progresses, it improves. As it improves, changes are made. Every change of model, every advancement, especially in mass-produced goods, means retooling, redesigning. Tools are not made by men of narrow skill. Tools come from the minds and hands of craftsmen who know the how and why of their material; what can be done to it, what it can do.

"The toolmakers and machinists of modern industry must be vastly more competent, immeasurably more highly skilled because of the very demands of mass production by narrowly skilled workers. In many cases, the less skill the machine operator has, the more must be built into the machine. Craftsmen build the machine.

"Almost without exception, every international union, be it a craft union or an industrial type organization, constantly urges its membership to cooperate with their employers in establishing and extending planned apprenticeship. We who do the skilled work, and we who do the unskilled or narrowly skilled work of the nation have no delusions about the vital need for apprenticeship."

Because both management and labor agree on the necessity for apprenticeship, and because they both

have a stake in good training, they should both be represented in a joint committee to determine program policies. Craftsmen on the committee will be as determined as management representatives to see that apprentices uphold their part of the agreement or indenture.

Joint Committees

Members of a joint committee should be chosen for their interest in youth and their understanding of apprenticeship problems. They often interview applicants and determine whether the youth is worthwhile apprentice material. They can assist in organizing and revising, when necessary, both shop instruction and related training curriculum. They can decide disciplinary action for apprentices, and can judge whether an apprentice is entitled to a pay increase by virtue of his progress.

In the matter of disciplining apprentices, good judgment must be exercised. The best and most comprehensive methods of apprentice selection cannot guarantee to overcome human frailties. Most apprenticeship programs have probationary periods ranging from three to six months. Formal agreements provide for a probationary period and there are some aspects of probation throughout the term. This serves as some check on a youth's aptitude and application.

One toolroom supervisor in a comparatively small shop cited the case of a young apprentice he rejected after two years. During that time, the supervisor had consulted repeatedly with the youth's parents. After each consultation, the youth seemed to apply himself better, but soon went back to his careless ways. He had mechanical aptitude but this was counteracted by his devil-may-care attitude. Keeping an apprentice in the mere hope he will "straighten out" doesn't make good sense. There are too many young men anxious to get a foothold in a trade.

Graduated Wage Scales

Pay rates for apprentices have increased in recent years. It is considered good practice to arrive at rates that will bring the apprentice's hourly wage rate to approximately 50% of the journeyman's hourly rate during the period of training. Too much as a starting rate can be as bad as too little.

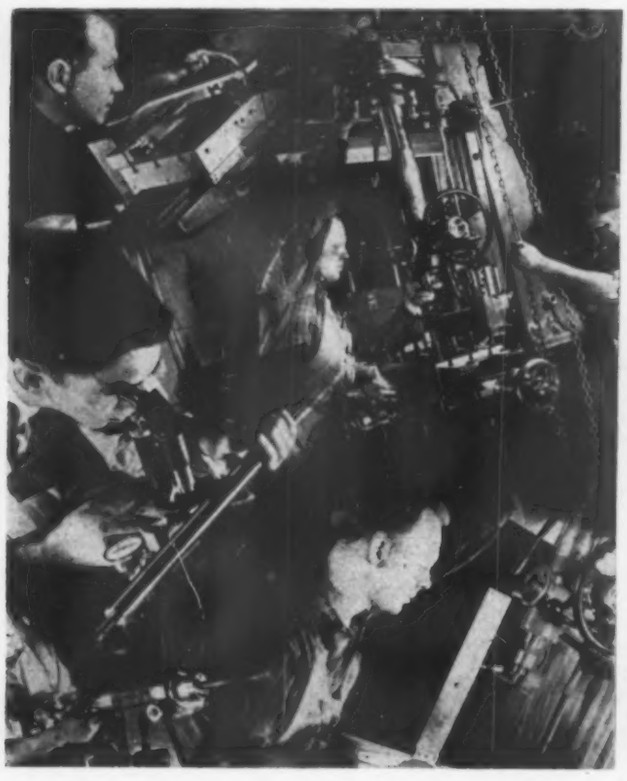
Among accepted methods of wage increments is the following:

First 1,000 hr. (about 6 months), 35% of journeyman's wages; second 1,000 hr., 40%; third 1,000 hr., 50%; fourth 1,000 hr., 55%; fifth 1,000 hr., 65%; sixth 1,000 hr., 75%; seventh 1,000 hr., 85%; eighth 1,000 hr., 90%.

Apprentice wage scales vary in different areas, but generally the sliding scale is used over the four-year period. Some firms pay apprentices for attending related study courses, whether it is carried on in the plant or at an accredited vocational education school, while others pay only for shop instruction hours.

Many firms either supply tools to the apprentice as needed, or arrange for him to pay for them at a discount out of his pay. It is considered good practice to have the apprentice acquire his own tools as the need for them arises. It gives him a better idea of the value of tools, imparts pride of ownership, and overcomes a habit often considered bad—borrowing tools from other workers.

Challenge of Metalworking—Finishing of raw metalworking materials into final products is a tremendous industrial bulwark in our scheme of things. Minds, trained in the processes of metalworking, coordinate hands and eyes in accomplishing intricate production jobs. This concept of apprenticeship in metalworking is drawing many alert young men into the fold of future craftsmen



Instructor Understanding is a mighty big factor in helping an apprentice along the road to skilled accomplishment. F. L. Frederick, an instructor in the Aluminum Company of America program, is shown giving a seasoned word of advice to an apprentice engaged in learning various aspects of radial-drill operations

Selection of Apprentices

Apprentice Interviews—Selection of prospective apprentices warrants time and care. Experienced interviewers can make a candidate feel at ease, yet extract from him the information which determines his eligibility. Specialized interviewers, however, are not necessary in smaller plants

INVESTIGATION into the background, intelligence and aptitude of an applicant for apprenticeship might sound involved. But experience records of successful apprenticeship programs through the years emphasize the importance of *studied selection*. Snap judgment has no more place in chosing apprentices than it has in applying new fabricating processes and techniques.

Even though the program calls for taking on only one apprentice a year, methods of selecting the prospect can be performed just as carefully as in companies taking on hundreds of apprentices annually.

Age is an important consideration. In normal times, the age limits for apprentices are 17 to 24 years. Many companies have temporarily waived the upper age limit to take on veterans of World War II. While veterans are making out very well as apprentice machinists and tool and die makers, it is generally conceded that in normal times younger men make better training material.

There are arguments in favor of both younger and older apprentices. A majority of plants contacted in connection with this report boasted of the high number of GI's enrolled in their courses. Invariably, however, veteran status did not obviate the taking of preliminary tests. They still had to meet standard requirements.

Several training directors said that although the veterans were older than those normally taught in the courses, their military training was reflected in good discipline, mature thinking, and an earnest desire to learn. Courses have been somewhat modified to meet the entrance of older men, but fundamentally the shop and related training remain the same.

With the number of GI applicants tapering off in the years ahead, the bulk of apprentices will come out of the nation's schools and the age bracket of 17 to 24 will again predominate.

A high-school diploma or its equivalent is held essential. Many boys are taking vocational courses in high schools which afford clear-cut evidence of their aptitude and interest in things mechanical. School officials are generally most receptive to requests for school data relating to an apprentice applicant. This information can go far in judging the youth's character.

Importance of Schooling

Modern apprenticeship represents the progress of higher levels of intelligence in mechanical fields. Complicated machinery of modern industry has represented a challenge to human astuteness. Theoretical considerations in this highly mechanized age are requisites. A youth in the machine shop of today is better off for having gone through high school and obtaining a knowledge of arithmetic, algebra, geometry, and the sciences. He is better equipped to adapt himself to the practical and theoretical work of industry.

With this school knowledge in hand, the apprentice supervisor might well weed out those who obviously don't come up to standards, and then arrange to have those still in the running examined by a physician. Too often the physical examination phase is overlooked or just plain passed up. But if physical flaws are detected at this stage, it might save time and money later on.

The rigidity of the physical examination depends on the company. The examining physician, however, should have a good knowledge of the type work the applicant will be expected to do. With this knowledge, the physician can gear his examination to fit the requirements.

After completing this phase of his screening, the applicant should be ready for some down-to-earth entrance tests, and here's where the processing can become cumbersome and is often bypassed. Testing should not become involved. It isn't a matter of testing an applicant's fortitude. Rather it is a matter of determining intelligently whether he will fit pretty well into the apprentice picture.

The testing atmosphere can be heavy or light. If it's heavy, the applicant is bound to become nervous to the point of jitters. If this condition prevails, he cannot be expected to expend his best effort and his rejection by virtue of it is a sad commentary.

Formalized Testing

Formalized testing does not have to be fraught with psychological hurdles. The youth being tested should be put at his ease. He shouldn't be made to feel that it is a matter of life and death. He

should, however, be impressed with the purpose of the testing by having it explained as being in his interest as well as the company's.

In the matter of tests, some companies have prepared their own examinations, geared to peculiar requirements of the company. Some of these tests are devised completely by men in the shop, others are commercial tests, which are readily available, and still others are a combination of the "homemade" variety and commercial type.

Commercial mental and manual dexterity tests represent a scientific approach in the selection of apprentices. They include information showing the tester how he can arrive at predictive values based on test results. Some of the companies dealing in commercial tests are listed in an accompanying box.

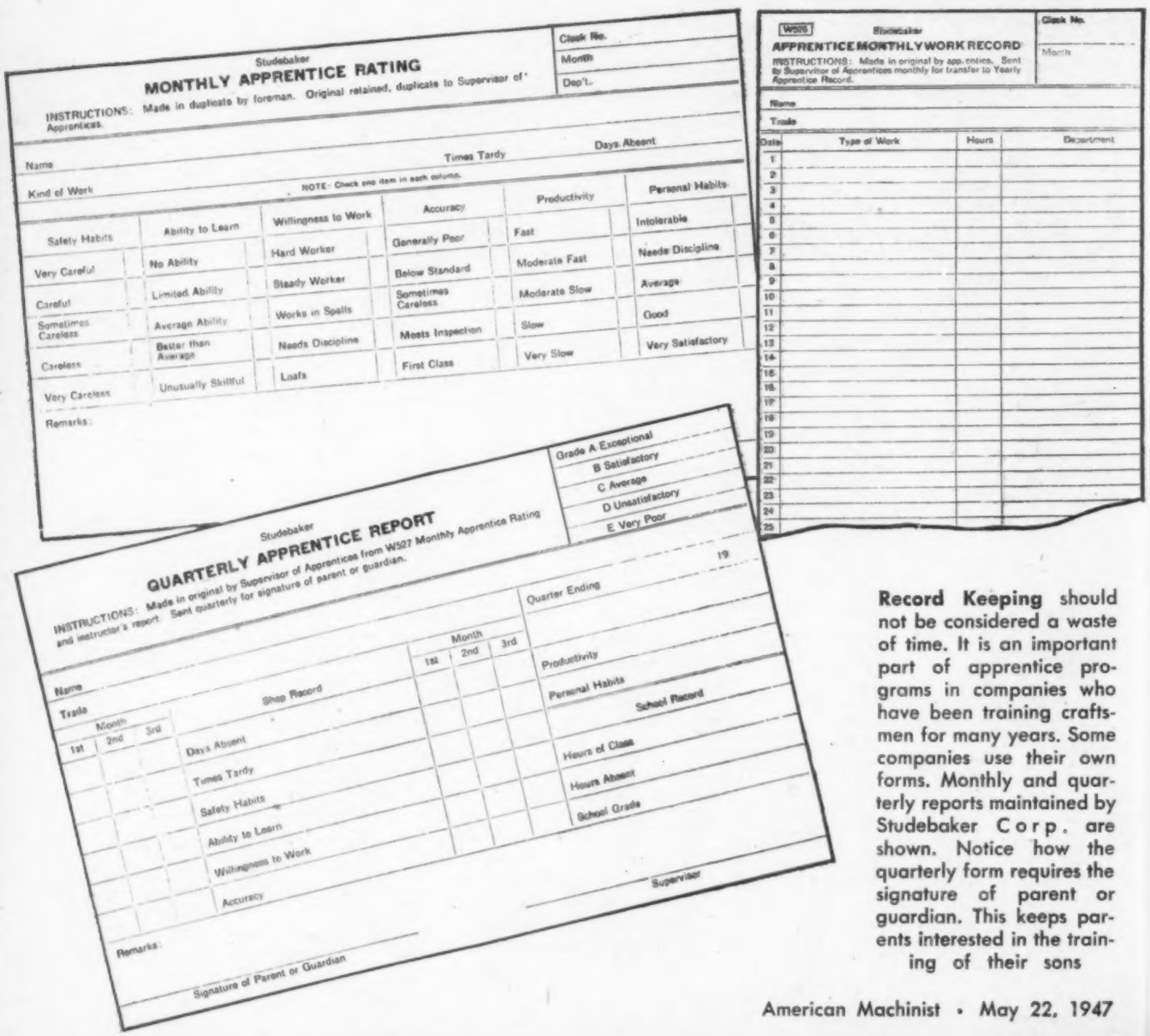
Any test is not worth the paper it's written on if the person conducting the examination is unable to arrive at conclusions. For that reason, commercial tests often might tend to confuse rather than search out the information desired. Several companies interviewed base the major part of their entrance tests on questions worked out by men right in the shop. This has considerable advantage because those who have worked out the questions have gone through the ropes and know full well what qualities are necessary for a youth to become a full-fledged machinist or tool and die maker. Beyond that, the person giving the test can better judge the answers.

Catch questions designed to trip up the youth have no place in such tests. The boy should be permitted to use his own good judgment in making his answers. He should not be bound by a set of accepted answers. During the war, for example, some of the best and most rapid methods of fabricating needed armament resulted from a worker departing from the conventional and trying out something new. Thus, if an apprentice candidate approaches an old question from a new angle, it might reflect initiative, a good quality in a craftsman.

Aptitude as a Factor

Aptitude for trade work, whether natural or acquired, can be detected readily during the selection process. A youth who is mechanically minded will invariably enter apprenticeship with a sincere desire to learn. He has been busy with his hands and has studied out problems, even though at the time they were hobbies which involved taking something apart and putting it back together again.

The fact a youth has hobbies which lean to mechanics does not necessarily mean he will make an excellent apprentice. His hobby work



Studebaker
MONTHLY APPRENTICE RATING

INSTRUCTIONS: Made in duplicate by foreman. Original retained, duplicate to Supervisor of Apprentices.

Clock No.
Month
Dept.

Name
Kind of Work
Times Tardy
Days Absent

NOTE: Check one item in each column.

Safety Habits	Ability to Learn	Willingness to Work	Accuracy	Productivity	Personal Habits
Very Careful	No Ability	Hard Worker	Generally Poor	Fast	Intolerable
Careful	Limited Ability	Steady Worker	Below Standard	Moderate Fast	Needs Discipline
Sometimes Careless	Average Ability	Works in Spells	Sometimes Careless	Moderate Slow	Average
Careless	Better than Average	Needs Discipline	Meets Inspection	Slow	Good
Very Careless	Unusually Skillful	Loafs	First Class	Very Slow	Very Satisfactory

Remarks:

W926 Studebaker
APPRENTICE MONTHLY WORK RECORD

INSTRUCTIONS: Made in original by apprentices. Sent by Supervisor of Apprentices monthly for transfer to Yearly Apprentice Record.

Clock No.
Month

Name
Trade

Date	Type of Work	Hours	Department
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Studebaker
QUARTERLY APPRENTICE REPORT

INSTRUCTIONS: Made in original by Supervisor of Apprentices from W927 Monthly Apprentice Rating and instructor's report. Sent quarterly for signature of parent or guardian.

Grade A Exceptional
B Satisfactory
C Average
D Unsatisfactory
E Very Poor

Name
Trade
Quarter Ending 19

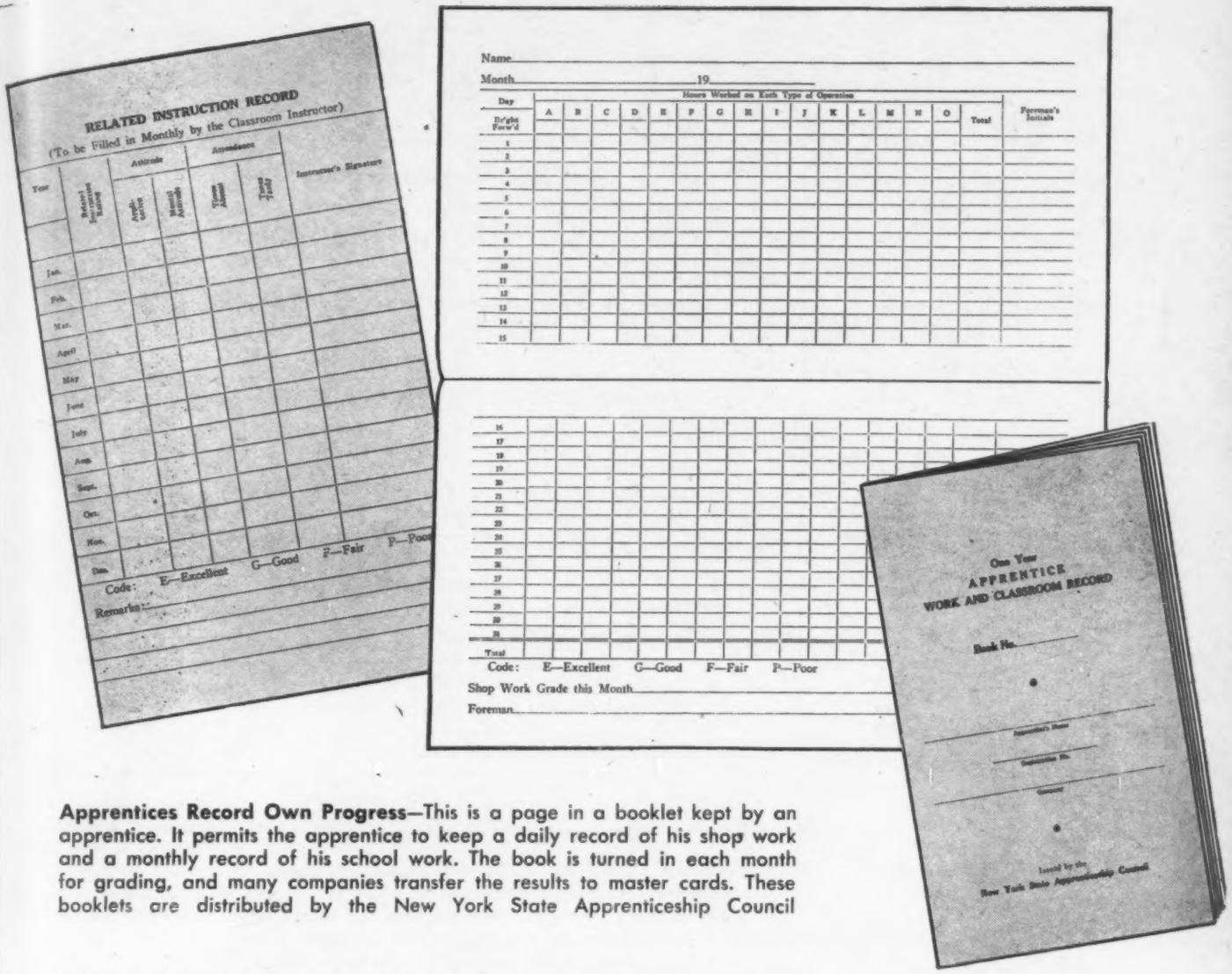
Month: 1st	2nd	3rd	Shop Record	Month: 1st	2nd	3rd	Productivity
			Days Absent				Personal Habits
			Times Tardy				School Record
			Safety Habits				Hours of Class
			Ability to Learn				Hours Absent
			Willingness to Work				School Grade
			Accuracy				

Remarks:

Supervisor

Signature of Parent or Guardian

Record Keeping should not be considered a waste of time. It is an important part of apprentice programs in companies who have been training craftsmen for many years. Some companies use their own forms. Monthly and quarterly reports maintained by Studebaker Corp. are shown. Notice how the quarterly form requires the signature of parent or guardian. This keeps parents interested in the training of their sons



Apprentices Record Own Progress—This is a page in a booklet kept by an apprentice. It permits the apprentice to keep a daily record of his shop work and a monthly record of his school work. The book is turned in each month for grading, and many companies transfer the results to master cards. These booklets are distributed by the New York State Apprenticeship Council

might be done carelessly and this in turn might be communicated to his vocational effort. If, for example, he has been interested in fixing cars, his success and attention to detail are worth examining. Generally speaking, the fact he has been interested in such things as an avocation is a good sign.

Those in charge of selecting apprentice candidates must refrain from associating a youth's interest in becoming a craftsman with something more tangible, such as aptitude. Regardless of training, some people would just never gain the knack of doing things mechanical. Mere assumption that a youth might absorb training is a rather weak premise.

Various commercial aptitude tests are available, but it is important that the results are interpreted properly. The person conducting and interpreting tests should base the results on the requirements of the trade. This makes it essential that the particular trade requirements be considered in making comparisons of aptitude test results.

Objective principles in selecting apprentices will be useless if the final choice of candidates is not based on the facts adduced. If the evidence gathered from a series of interviews and tests is to be considered lightly in making final decisions, there will be no percentage in using objective test methods.

Upon final selection of an apprentice candidate, it is advisable to point out in detail the things he can expect of the company, and in turn the things expected from him.

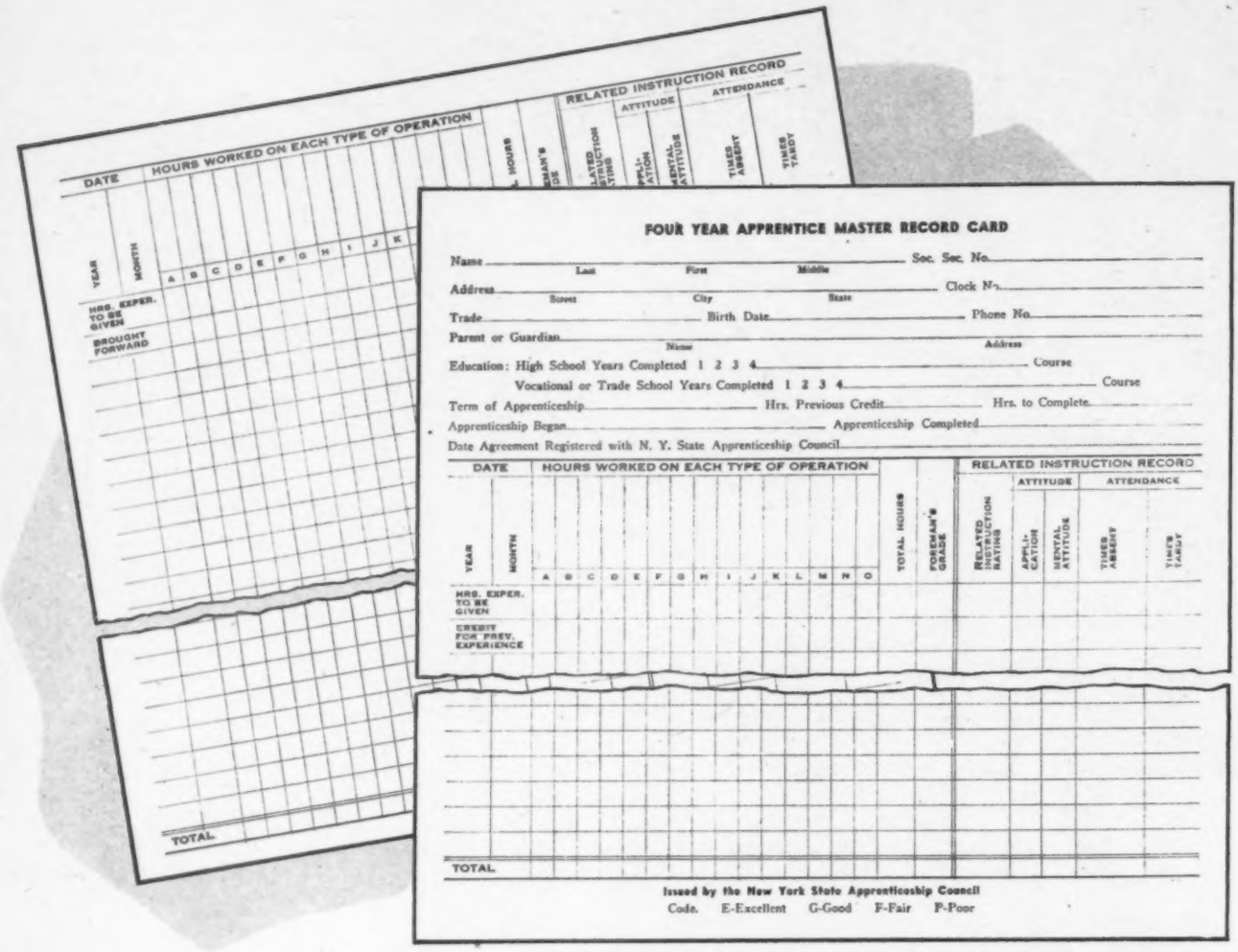
Written Agreements

A written agreement between apprentice and company is recommended for several reasons. It should contain a statement of the trade or craft being learned, the length of apprenticeship, and the length of the period of probation—usually from 3 to 6 months—during which the apprenticeship may be terminated by either employer or apprentice, generally with written notice.

A written agreement fixes definite responsibility, and, if worded properly, leaves no room for doubt in the apprentice's mind as to his future. It holds the employer, foreman, journeyman and apprentice to the purpose of the apprenticeship, and aids in completion of the training period within the length of time specified.

Experience in various shops shows that apprentices rarely break a written agreement, and some companies report the turn-over of apprentices under agreement has been less than half the turn-over of the regular force. Furthermore, the signatures of parents are necessary for agreements involving minors. This generally means the parents are willing to cooperate and help their sons in fulfilling the training requirements.

The small shop, though taking on



Master Record Cards should be maintained and kept up-to-date. This form, issued by the New York State Apprenticeship Council, represents progress through the years in arriving at a simplified and concise record form. When completed, this record presents a rapid appraisal of the apprentice over a four-year period and makes good reference material

only one apprentice a year, might well resort to written rather than oral agreements. No apprentice agreement holds management to anything more than a promise of "reasonably continuous employment," with the understanding that should business conditions require laying off mature workers in the plant, apprentices also should be laid off in proper ratio until conditions improve.

Small-shop operators might feel they cannot launch a comprehensive apprentice program because they lack full training facilities. This has been answered in large measure by many sections of the country through establishment of area programs. Companies agree for interchangeability of apprentices to give them the necessary all-around training. Such programs have won support of the Federal Apprentice-Training Service, and have gained the cooperation of vocational-school authorities.

In this immediate postwar period, apprentice candidates have been available in good quantity. Plants establishing or operating full courses should keep the programs in the public eye, so high school students and their parents will be aware of the possibilities apprenticeship offers. Many companies prepare booklets which guide thinking on the part of youth. By keeping young students impressed with the advantages of learning a craft, the selection of apprentices will be made from young men whose interests have been whetted by training facts with which they have become familiar.

Some Suppliers of Commercial Tests

California Test Bureau, 5916 Hollywood Blvd., Los Angeles 28, Calif.
Public School Publishing Co., Bloomington, Ill.
Science Research Associates, 228 S. Wabash Ave., Chicago 4, Ill.
Sheridan Supply Co., P. O. Box 837, Beverly Hills, Calif.
Stanford University Press, Stanford University, Calif.
The Psychological Institute, 3506 Patterson St., N.W., Washington, D. C.
World Book Company, 2126 Prairie Ave., Chicago, Ill.

TYPICAL COMPANY REPORTS ON TESTING

At a recent meeting of the American Apprentice Round Table the question was asked: What are the members of the group doing in the way of tests, and to what extent are the results of these tests used in the final selection of young men as apprentices? These answers are a cross-section of company thinking:

1. One company has used tests to check academic attainment in high school. There are 100 objective-type questions, 20 in English, 20 in geography, 20 in drawing, 20 in mathematics (including logarithms and trigonometry), 10 in chemistry, and 10 in physics.

2. One company uses the following commercial tests: Wunderlich personality test; Borodeer test; Bennet mechanical comprehension test.

3. In one plant, department foremen do the testing. They have developed standards which they themselves have set and they will not take anyone who cannot meet these standards. Their experience proves that men who cannot meet the standards do not get along. They are sold on these tests and use them chiefly to supplement the interview with the applicant.

4. In one firm, a graduate apprentice has worked out a test that is given to applicants to determine:

(1) Approach to a problem—(a) logical (b) average (c) guesses

(2) Reaction or rate of learning—(a) fast (b) average (c) slow

(3) Ability with mathematics—(a) learns rapidly (b) with difficulty

(4) Understanding of drawings, drafting experience, and conception of drawings.

5. One firm formerly used tests but discontinued them since inclusion of a 90-day probationary period. It was felt that when tests were used, the number of rejected applicants as a result of the tests did not warrant their cost. Now they are getting more rejects from interviewing and counseling. The cost of testing each applicant did not warrant itself.

6. Another firm tried tests and still uses them—but is not entirely convinced that it is the proper solution for selecting the men wanted for the company.

7. One company has a 3-hour session of testing for applicants. This firm cannot see the complete value of tests. The individual being tested is not the same person under test as he is when met on the street. Officials believe tests are valuable when you are in doubt, but they do not abide by their results. They still reserve the right to adopt or reject applicants as they see fit.

8. One member remarked that his firm uses counseling and interviewing as a basis, but uses a test to aid the interviewer.

9. One firm claims that testing mainly keeps it from getting young men that look good but test bad.

10. In one firm, executives consider the interview counts 40% and the battery of tests counts 60% in the final selection of a man.

11. One firm uses tests to supplement the interview and check applicants' educational backgrounds. Executives there believe the greatest benefit of tests comes in weeding out those unsuited for the work rather than in selecting those who are suited. Tests give them something on which to base rejections.

12. One spokesman emphasized the importance of character. He said that they prefer to find out a young man's qualities during the probationary period. Tests are only used to make certain a young man has absorbed his elementary school work.

13. One firm reported a turn-over in apprentices of 40% before resorting to tests for selection. The turn-over has dropped substantially.

14. Several firms use 90-day probationary terms to obtain all-around knowledge of an apprentice candidate. Final selection is made at the end of the 90-day period, and rejections are minimized.

Craftsmen Have Pride in Their Tools—Many companies enable an apprentice to obtain his own tools as he progresses in his training. This impresses upon him the importance of taking care of tools and tends to keep him away from the habit of borrowing tools from others

Preparation of Training Schedules

IT HAS BEEN SAID before that modern apprenticeship is no "hit-or-miss" proposition. To be effective, shop training must follow a pattern over the four years and must be correlated with related or theoretical training. It must be kept in mind that an apprentice is being *taught* a trade, and shouldn't be expected to learn as best he can.

A breakdown of the trade should be made. The maxim "First things first," should be taken into consideration. By charting the shop course in advance, the apprentice can gradually go from the simpler machine tasks to the more complex work over the four-year period.

Genuine apprenticeship demands the dual relationship of shop work and related instruction. Requiring an apprentice to attend 144 hours of classroom instruction a year just isn't enough. Unless there is some relation between the classroom and practical shop work, the training program is at loose ends.

Many of the larger companies have established trade schools in connection with their apprentice programs. This is one way to correlate class and shop training, but most metalworking companies, who are duty-bound to join in training craftsmen, cannot afford such a program.

Vocational School Cooperation

Public school systems in most communities today include vocational courses in their curriculum. These schools, which are financed in part by federal funds appropriated under the Smith-Hughes and George-Dean Acts, are responsible for providing educational service of this kind.

The Trade and Industrial Education Service, Vocational Education Division, of the U. S. Office of Education, reports the number of public trade or vocational schools have grown to great proportions. The governmental service has performed yeoman work in forging a bond between vocational schools and industry.

School authorities responsible for vocational education are anxious to learn the needs of industry and are willing to work out programs that will fit into shop training procedures. If the shop courses have been analyzed and prepared into an outline, consultation with the vocational school director will indicate the pattern of related classroom instruction.

If, for example, the shop training starts with the tool crib, the apprentice's related instruction should involve information he would receive normally on the job. It might include freehand sketching, arithmetic, especially decimals and fractions, and possibly data about steels. When the apprentice progresses to lathe work, related instruction can provide the technology relating to a lathe. He can be taught in the classroom, the construction, uses and limitations of lathes. Similarly, he can learn the necessary mathematics and start learning to read blueprints.

If the classroom instructor is advised of shop steps the apprentice will take, he can organize related information into specific units of related instruction. Revisions in training procedure might be necessary from time to time. These should be worked out on a dual basis. Modern industry is not static. Apprentice-training courses cannot follow a set pattern year in and year out.

The company sponsoring apprentice training under an arrangement for outside classroom instruction should take a keen interest in the apprentice's classroom diligence, deportment and attendance. It is advisable that the apprentice be aware of the company's interest in his related training progress.

Following are typical shop training breakdowns and related training instruction. No hard-and-fast pattern can be presented because of the varied requirements for individual metalworking shops. While many shops are not in a position to give the over-all training suggested, most can draw from the outlines presented and determine whether an apprentice will obtain sufficient training to reach journeyman stature. Regional and field offices of the Federal Apprentice-Training Service will assist in formation of apprenticeship programs. In states in which a state apprenticeship agency is established, assistance is also frequently given by the state agency.

All-Around Shop Instruction

A general breakdown of shop work that makes up the machinists' trade is presented. Hours opposite the work units will differ in plants throughout the country. The type of work performed in one plant may require an apprentice to spend more time on one process than on another. Whatever hours are apportioned, the total should reach the neighborhood of 8,000 hours spread over four years. Hours can be broken down into semesters to enable orderly procedure for periodical examinations to determine an apprentice's progress and absorption of his training.

Based on the general breakdown, a specific breakdown of job steps is presented herewith:

1. *Tool crib and preliminary:* general helper, putting away stock, learning hand tools, learning steels, sawing, stock, files and filing, sharpening tools.

2. *Drillpress:* grinding drills, sharpening, reamers, making holes to size, drilling in jigs, special fixtures, lubrication; *radial drill:* grinding drills, sharpening reamers, making hole to size, drilling in jigs, drilling from layout, tapping holes, holding work.

3. *Lathe operation* (engine-bench): drilling, reaming and cutting off in chuck; reaming, diethreading and tapping in lathe; grind tool bit; simple turning on centers; shoulder work on centers; turning to micrometer measurement on centers; mandrel and arbor work; special lathe work; setting up for chuck work; threading (V, square, worm, left-hand, inside); setting up faceplate work; chuck and faceplate work; taper work; eccentric and offset work on lathe; miscellaneous faceplate work.

4. *Milling machine* (universal and vertical): rough milling; milling to depths and widths; plain milling on angle cuts; dividing head; gear cutting; taper milling; side milling; face milling; end milling; slab milling; gang milling; slotting operating.

5. *Shaper:* simple shaper vise work; advanced shaper vise work; shaper table work; angle shaper work; form work; general shaping of surfaces to accurate sizes; splines; keyways.

6. *Planer:* layout work; packing and holding work; use of blocks for measurement; roughing and finishing kinks; use of fixtures; (see shaper).

7. *Grinders:* general surface grinding; cylindrical grinding; internal grinding; cutter grinding; tool grinding.

8. *Drafting room:* blueprint files; reading plant prints; familiarization with plant engineering and design problems and policies; sketching.

9. *Turret lathes and screw machines:* machine a webbed balance wheel; make a pure spur gear blank; use of stops and dials, learn feeds and speeds; lubrication and coolants; machine outside of cone pulley; machine inside of cone pulley; various plant jobs involving turret lathe;

Accuracy Counts—Slip-shod work has no place in machine shops. An apprentice is impressed with this at the outset. A skilled instructor is shown observing an apprentice as he checks alignment of a spindle after rebuilding a lathe. The measuring tools of the trade eliminate "hit-or-miss" operations and apprentices learn to work within close and precise limits

Source: Moore Special Tool Co., Inc.

Charting Apprenticeship—A breakdown in the various apprenticeship steps has been drafted by the Moore Special Tool Co. Basic work covers a two-year period. Apprentices then are segregated into courses for all-around machinists, top operator or specialist, and tool-die work. Those completing all-around machinist and tool-die work receive diplomas, but can go on to a fifth year of training for higher jobs

Safety Habits should be impressed on the apprentice throughout his training course. Here, a General Electric Co. apprentice is shown wearing safety goggles in working on a cutter. Besides sharpening cutters, the apprentice receives wide experience on other types of grinders

Skill and Patience are requisites of diemaking. After obtaining all of the training necessary to qualify as a diemaker, the apprentice is capable of making a sectional, form-ground lamination die with dimensions held to ± 0.0001 in., as shown in specimens

making screws and studs; making nuts; various plant screw-machine jobs.

10. *Boring mills:* universal—single point boring and bottoming to size; vertical—drilling, reaming and cutting off in chuck; boring for hole locations.

11. *Bench and floor work:* use of portable electric tools; bearings; machine assembly; babbitting; welding; grinding; reaming.

12. *Welding and heat-treating:* welding machine operation; use of electrodes; starting and using the arc; common joints with bare electrodes; coated electrodes; pipe welding; testing methods; hardening of medium- or high-carbon steels, low carbon steels (surface or case hardening), high-speed steels; temperatures and precautions in annealing; use of oil, water or brine for quenching, tempering and temper colors.

13. *Machine maintenance:* Involves general repairs and maintenance of all plant machinery.

GENERAL BREAKDOWN OF SHOP WORK

WORK STEPS	APPROXIMATE TIME (HR.)
1. Tool crib and preliminary	400
2. Drill press	100
3. Lathe operation	1,500
4. Milling machine (vertical and horizontal)	1,250
5. Shaper	300
6. Planer	200
7. Grinder (internal, external and surface)	1,000
8. Drafting room	150
9. Turret lathes and screw machines	400
10. Boring mills (universal and vertical)	200
11. Bench and floor work	750
12. Welding and heat-treating	250
13. Machine maintenance	1,500
Total	8,000

Supplemental for Apprentice Tool and Die Makers

This will comprise working from blueprints or jigs, fixtures and tool work of various types covering as much as the time schedule permits and the aptitude of the apprentice allows. In diemaking, the apprentice will actually work from blueprints and will perform various kinds of die work. He will learn first-hand the setting up of dies, tools, jigs and fixtures, and their use in production.

The apprentice tool and diemaker should be subject to close supervision.

Related Instruction

While vocational schools can carry on the bulk of related instruction, some companies have taken advantage of training films, which received wide use during World War II in training plant personnel and military mechanics. Many excellent training films are available and often serve to put across points related to practical work. If a small room is available, such films can be shown in the plant to supplement the actual work apprentices are performing.

In connection with related instruction, a minimum of 144 hours a year is generally recognized. As

mentioned earlier, if the instructor knows the actual sequence of work experiences of the apprentice, he can adapt related instruction to conform. Supplementary instruction covers basic instruction, technical instruction and trade orientation instruction for machinists, and tool and die makers.

Instruction Definitions

Basic instruction includes basic mathematics, science, blueprint reading, sketching, drawing, and theory that is required by the apprentice to understand the technical knowledge required in the trade and to perform the work effectively.

Technical instruction includes a study of the tools, machinery, processes and materials of the trade work.

Trade orientation instruction includes a study of apprenticeship requirements, history of the trade and industry, trade products, personal and industrial relations, laws and regulations affecting work, safety, health, etc.

Book on Machinists' Trade

A complete treatment of related training for apprentice machinists entitled "Supplementary Instruction for the Machinist Trade," has been prepared by the U. S. Office of Education, Federal Security Agency, Washington, D. C., in cooperation with the National Association of State Supervisors of Trade and Industrial Education, and the National Association of Industrial Teacher Trainers.

Micrometer Mystery is overcome for these young apprentices as the instructor uses a huge model in showing the operation. Visual aids are important items in training, and many companies use training films to supplement shop work. Use of training films won widespread acceptance during World War II

Preparing and Keeping Records

Paper work in organized apprentice training is essential. It is not as complicated as it might appear, because various companies who have operated apprentice programs for many years and the Federal Apprentice-Training Service have worked out simplified forms.

In smaller plants, one clerical worker can be assigned the responsibility for maintaining records. Various state apprenticeship agencies supply books and record cards which represent an integrated record system. An apprentice can be given a book showing the work schedule and various processes. He can keep his own time and progress records and have the book signed at the end of each day or week by his shop instructor. The company, however, should keep its own records so it is aware at all times of his progress and his eligibility for more pay.

The time involved in keeping an up-to-date record system is worthwhile. The records speak louder than words in determining qualifications for responsible positions as foremen, supervisors, etc.

Blackboard Sessions are an important part of the apprentice training program at General Electric. Under the watchful eyes of an instructor, apprentices are shown working out problems related to their shop work

Summary

Much has been written on the subject of apprenticeship. Numerous companies have prepared booklets reviewing their apprentice programs. The Federal Apprentice-Training Service maintains a reference file of available literature. Many excellent books have been written on apprenticeship with specific sections on training machinists. One of the newest is "Industrial Apprenticeship," by Paul Bergevin, published this spring by McGraw-Hill Book Company. The Ford Motor Company book, "Shop Theory" is an excellent treatment (McGraw-Hill Book). Most machine-tool manufacturing companies have booklets available describing the operation of the specific machines they produce.

Aside from making available a

Certificates of Apprenticeship—Awarded apprentices when they have completed their training, diplomas are issued by State apprenticeship agencies or the Federal Committee on Apprenticeship in states in which no such agency operates. Individual companies often supplement the certificates with their own individual diplomas and bonuses, generally awarding them at ceremonies

variety of comprehensive literature, the Apprentice-Training Service has staff members available in regional offices to assist in formulation of programs. State apprenticeship councils likewise have data for distribution and many of them, such as the New York State Apprenticeship Council, publish periodicals covering apprenticeship. Associations related to metalworking are interested in apprenticeship and have, from time to time, prepared studies and analyses based on the subject.

Progress Record Kept

One company engaged in apprentice training over a great many years, has a booklet covering all the apprentices trained under its sponsorship. It gives the dates of apprenticeship, and then follows through on each individual to show the type of work he is engaged in at present. Many of the apprentices have risen to substantial heights in industry. Executives of the company are proud of the progress made by men who started out under its tutelage.

Programs Bring Satisfaction

Companies sincerely interested in establishing apprentice programs can avoid many problems by taking advantage of data gleaned through the years as a result of practical experience in apprenticeship. Inauguration of training programs and enlargement, where possible, of those already existing are commendable enterprises. Such companies assure themselves of competent future employees, trained in company policies and operations. Beyond that comes the satisfaction of contributing immeasurably to the cause of keeping industry supplied with top-notch craftsmen.

We Acknowledge...

The assistance and cooperation of various agencies, machine-tool manufacturers, and other companies engaged in metalworking operations enabled preparation of this report. Among those assisting were:

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General Motors Corp.
Gisholt Machine Co.
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Kollsman Instrument Co.
Moore Special Tool Co.
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Wright Aeronautical Corp.

WORLD LEADERSHIP...

Our Duty and Our Opportunity

CAPITALISM in Europe and the rest of the world is challenged by a real and formidable rival, communism. For capitalism to thrive a reasonable amount of prosperity is essential. Communism uses poverty to advance itself.

Except for the Western Hemisphere, most of the world came out of the war poor. Two years after V-E Day it is still poor. It needs dollars. It needs credit. It needs capital. It needs trade. It needs technical and managerial skills.

If we in America are to help the rest of the world back to its feet, starting it again on the road to peace and a free economy, we should try to supply those needs within the limits of our capacity.

We must not overtax our own strength. For the first requirement of a stable world is a strong United States. But we must accept leadership in international economic recovery—in our own self-interest.

What can the United States do to help men back to prosperity in a world economy which will allow them *freedom and incentive?* There are many things. But here are two of the most important:

1. The United States, through Congress, must determine the pattern and the total of the foreign loans or grants it can afford. We must answer three questions. How much will the new program cost? Can we afford it? Have we the technicians and managers to watch the loans, assuring their fruitful use?
2. We must demonstrate that we do not intend to raise our tariff walls to prohibitive heights when our debtors begin to repay us in goods and services, which is the only practical way they can pay us. Otherwise our loans will become losses.

If the United States is to meet even the minimum requirements of world rehabilitation, Congress eventually must authorize more advances than those to Greece and Turkey. The $400 million for those two countries will not do the over-all job of political and economic defense which we have begun. A minimum of $5 billion, if promptly and wisely applied in eight to ten countries, might suffice. BUT this $5 billion will be on top of approximately $16.8 billion which we have spent or earmarked during the past two years for use abroad, including our full share of the World Bank and Fund. We shall do a faster and more effective job if Congress will thus add up the foreseeable total of our international aid, and, even though the total looks imposingly large, commit us to it, with proper collateral safeguards from the debtor nations.

Congress need not try to foretell all contingencies, like last winter's weather in Britain, and it certainly should not create the impression that nations need only ask for billions to receive them. On the other hand, the war should have taught us the miserable consequences of "too little and too late." The President should have learned that he engenders skepticism by going to Congress with parts of a program, as he has done in the British, Grecian and Turkish loans. Within the limits of our capacity, we must make the decision now to see the whole job through—or throw in the sponge.

In the interest of the debtor nations—as well as in our own interest—the loan program should be hard-boiled. Rehabilitation loans must really rehabilitate. They must produce a state of economic health which will permit the World Bank and private capital to take over the task of financing world recovery—as perhaps can be done today in France and the Low Countries.

The loans, therefore, must be within the limits of our technical and managerial ability to implement them. Without technical help, Greece can not use its loan effectively—to rebuild railroads, clear ports, revive agriculture. Without skilled supervisors, Germany can not be made to pay its way. Money alone won't pull China from the brink of economic chaos.

Our lending calls for more than money. It calls for trained personnel to help the recipients utilize the loans effectively—geologists, construction and sanitary engineers, monetary experts, and management and agricultural specialists.

Loans are necessary but they are only a first step. A long-range program requires the opening of the half-closed doors of world trade—our own door, too.

We will have to get used to the idea that, when our debtors pay us, they must pay us largely in goods and services. Refusal to permit such repayments in the twenties helped start the world depression in the thirties—and the loss of our investments. *Imports do tend to raise living standards, and a two-way trade program need not require us to slash our present tariff rates.*

The complexion of our foreign trade has changed since the war. Our manufacturing capacity has increased and our raw-material self-sufficiency is tending to decline. For example, we probably shall have to continue importing copper and zinc and to increase our prewar dependence on imported lead. We may soon have to depend heavily on imported oil, and—gradually—on a growing volume of iron ore from abroad. Our normal dependence on imports for commodities like rubber, tin and silk will continue.

Our population has gone up 10 million in the last decade, and we now have a $176 billion national income, making room for more imports.

As a result of every nation's recent attempts to make itself secure and self-sufficient by slamming its trade door, a world-wide series of quotas and restrictions is blocking international trade. Even more, government buying and selling threaten to take commerce out of the hands of private traders, placing it in the uninspired care of bureaucratic negotiators.

Our government has taken the lead in calling the conference of 18 nations, now meeting at Geneva, to open as many trade doors as possible. The American delegates will bargain product by product and country by country—all summer, if necessary—for lower tariffs, fewer quotas and a free flow of *private* trade. The task is a long one, and the results are as yet uncertain, but, if success is achieved, an immense opportunity for good works and good earnings will lie before American businessmen.

This is no picayunish opportunity. Authoritative estimates put our 1947 exports at $11 billion and our imports at $6 billion. That's substantial. It is greater than the value of all crops grown on our farms ($10½ billion) and exceeds the value of all shipments of industries such as automobiles ($9 billion), textiles ($8 billion) and chemicals ($8 billion).

International trade is vital, not to be shrugged off, not to be kicked around as a football of party politics. Republicans and Democrats agree on a non-partisan foreign *political* policy. They should agree also on a non-partisan foreign *economic* policy. The foreign relations of the United States, political or economic, can no longer be log-rolled hither and yon.

A general program for international recovery, outlined here, will bring its full quota of aches and pains. But lack of a program will produce economic and political troubles on a vast scale; timid retreat will invite economic disaster and war.

By an intelligent, bold and resourceful program, we have a chance to win through to a long peace in the kind of world we want. *Unless America provides the leadership, there can be no such program.* Then Communism merely needs to hang around long enough to pick up the pieces.

Ours is the responsibility and the opportunity.

James H. McGraw, Jr.

President McGraw-Hill Publishing Company, Inc.

A NEW ENTERPRISE

Advocacy by the McGraw-Hill Publishing Company, in the accompanying editorial, of an effective world economic policy is not a mere verbal exercise. In the faith that we as a nation shall develop such a policy, this Company, following a trail blazed by leaders in American industry and finance, is expanding its operations overseas.

A newly created McGraw-Hill International Corporation will push forward the frontiers of our technical magazine and book publishing business throughout the world. The new Corporation comprises:

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In addition, the McGraw-Hill Book Company has an overseas network for the distribution of its books.

THIS IS THE 58TH OF A SERIES

ROUND TABLE

Are Toolmakers Obsolescent?

"Say, Ed, one of the front-office engineers was telling me the days of real journeyman tool and die makers are numbered."

"That's a cockeyed idea, Al, if I ever heard one! That guy's nuts. Journeymen have been and always will be the guts of the toolroom."

"I'm not quite so sure, Ed. Not so very long ago, guys out in the shop used to plan and do most of the work on every job. What do they call that now? 'Custom manufacturing', or maybe 'jobbing', I guess. Now, out in the shop, each guy does only one operation, or even part of one operation, day in and day out. Maybe tool and die making will be that way soon."

"I don't think so. Sure, production today is specialized, but that's all right because of interchangeable manufacturing and big volumes. Now take toolroom work. It's special tools and a few at a time. It's cheaper and better just to give a journeyman the print and say, 'Go to it!' "

"But, Ed, isn't specialization by operations creeping into the bigger toolrooms? A grinder operator does all the grinding, and it's the same on the lathes, mills, and so on. A machine operator doesn't get journeyman pay, so it oughta be cheaper."

"It's not cheaper in the long run, because the operator takes longer and scraps a lot of expensive stuff if he isn't watched all the time. Even then, there are lots of jobs he can't do. Remember what happened whenever you put one of those war machinists on a job he wasn't trained for? They were all one-job experts—no good when experience or know-how was called for. Give 'em tooled-up machines and they were wizards, but that was the end of it. On production operations, we just took out most of the skill with good methods and machines. You can't take the skill outa toolmaking that way."

"Why not? Toolroom methods have certainly been improved—and look at that 'Keller' chewing away at that forming die. A lot of skill has sure been taken out of that operation."

"Oh sure, Al. A lotta skill's been taken out of the actual operation and put into the machine, but journeyman planning and know-how can't be put in that machine. That machine can't work from just a print, but the journeyman can."

"Who supplies the know-how and planning in toolrooms where they do specialize?"

"A lot of it's supplied by a journeyman leader or foreman. They still need the journeyman."

"Don't you think that can be supplied by all these 'kid' engineers that are going to start flocking out of college."

"No. Know-how can only be picked up by going through a good apprenticeship."

"Ed, I hear some of these college courses are getting mighty practical. How about apprenticeship courses? Darn few of 'em today."

"That's not so, Al. Lot of outfits are seeing their mistakes and starting apprenticeships again."

"It still seems to me, Ed, that the good old journeyman days are going fast, and pretty soon all the toolrooms of any size will just hire machine operators."

***IS THE URGE** to specialization demanding more skilled men or does it require fewer? What about setups and maintenance? Your opinions and ideas on this subject will interest others. Discussions of earlier topics appear on later pages.*

What Foremen Should Know About Costs

BY ROBERT J. SPENCE

Costs need not be a mystery to your foremen—some knowledge of them will help them to control their departments efficiently

COST ACCOUNTING, as used in industry, has developed into a science and has become a potent factor in formulating valuable information to management for use in various controls.

Much of the so-called "paperwork" of a foreman goes to the cost-accounting department as original cost data and as such plays a vital part in cost finding. When a foreman understands this and knows to what practical uses his reports are to be put, he is more inclined to be accurate in his recordings.

Figures are cold things to deal with, and many a foreman has resented for days some act of a superior who was merely translating cost figures into a request for foremanship action. To the superior this was routine work, but to the foreman, who did not know what was behind the request, it was unreasonable in the light of all the other work which he was doing.

Your foremen should learn the facts about the cost system in the plant and get the latest cost figures for their departments. At times they will be astonished at what they find. Let me give two examples.

The first was a discovery by a foreman that an idle machine with its overhead costs was a greater charge against his department, on the higher-priced machines, than an idle operator. After that he made a greater effort to minimize machine idleness as well as operator idleness.

The second example was an unusual one. A large firm which made a number of different kinds of low-priced items in its several divisions, suddenly found that their closest competitor on one popular article was selling them for ten cents each in national chain stores. This was alarming because the firm's figures showed a cost accounting charge of twelve cents to manufacture. The planning department investigated but found everything in production to be highly efficient and with no hope for lowering the cost.

The foreman asked for and received a detailed cost report on the product. He learned something that surprised him and he settled the matter immediately. It so happened that this foreman was operating two adjoining departments on this product and that each department was being charged with a 250% overhead. He had the two departments combined and one of the overhead charges dropped. They were then able to meet competition and regain lost business.

Cost systems vary to a great extent and it is difficult to speak about them in generalities, but in all systems there are basic elements which are about the same and can be roughly noted. These basic elements are direct labor, direct materials and administrative expense.

Direct labor. Under this heading is listed the labor which is required in a department to produce a unit. In some plants it may mean just what it infers: the cost in money or time of actual productive labor on the unit. In other plants it may include the actual labor and the "direct" labor which can be fairly charged to the unit, such as inspection in the department, packing for shipping, or any other direct contact with the progress of the unit while it is in the department.

Direct materials. This heading means just what it says: the actual cost of the materials which enter into the unit.

Administrative expense. To direct labor and direct materials costs there is added what is called "administrative expense" or "overhead."

It is this overhead which has been so commonly misunderstood, and because of this misunderstanding trouble has arisen in many shops. One result is the open denunciation of management by a worker who has just completed a job for a shop customer and then learned that the firm had charged the customer two, three or four times the wages which he had received for doing the work.

Under administrative expense there is placed the cost of the indirect work, such as a departmental sweeper, oiler or others; the cost of repairs to departmental machinery, repairs to the building; cost of departmental supplies; cost of small tools which have such rapid wear as not to be classed as an asset; cost of power, heat, light and floor space; and, sometimes, a direct departmental cost of taxes, depreciation and insurance on the equipment in the room.

Then comes a charge to the department of its proportional share of what is called "General Shop Expense," in which is figured such things as the shop superintendent's salary, wages of stockroom help, interdepartmental truckers and others.

In a large corporation in which the organization has been developed to an extensive degree to fit its particular needs the general shop expense includes such departments as purchasing, planning, tool, maintenance, power, inspection, safety, stores, traffic, shipping, designing and training.

Tnen as another section of this administrative, or overhead, expense there is Selling Expense. Under this is listed the salaries of the department head and his assistants, the salaries of the salesmen and their traveling expenses and all costs of advertising and other promotional efforts which enter into the selling of the company's product.

Under administrative expense there is also a general expense account in which is placed everything that cannot be interpreted as belonging to shop or sales. In small plants it embodies the salaries of management and their official expenses, the costs of the office help, telephone, telegraph and postage and other items.

These basic elements of cost accounting may be refined to an extended degree and often are if the firm sees that it pays to do so. The whole plan is to segregate different types of expenses into small groups so as to find quickly the cost facts needed. The routine by which detailed cost data is obtained and assembled is not universal and the technique of assembling will be of little interest to the foreman, but the knowledge that his shop finds it advisable and profitable to go into detail in obtaining costs should show him the value of a cost system and encourage cooperation on his part.

Practical Ideas

Precision Taper Measurement With Micrometer Calipers

S. FRAMURZ
Bombay, India

To determine tapers of cylindrical objects with a high degree of accuracy the accredited practice is to use a sine bar and precision gage blocks, with a comparator for indicating. This setup is cumbersome at best, and requires much time, care and skill. The method explained below is offered as an improvement over the conventional technique. Though it is a modification of the accurate sine bar method and is fully as precise, it has definite advantages of its own. These will be better appreciated after the suggested method has been described.

Two accurate parallels and two toolmaker's buttons are used. One parallel has the buttons fixed on it an exact known distance apart, say 10.000 in. The second parallel has no buttons but is about ½ in. higher than the first. The buttons are set flush with one side of the parallel so that when the two blocks are brought together on a surface plate not only do their mating faces contact all over, but the two buttons also make a line contact along their full height, as shown in inset, Fig. 1. To find a taper, the object is sandwiched between the two blocks on a surface plate, and dimensions D and d are measured (Fig. 1). The difference of D and d, divided by the distance apart of the buttons, gives the sine of the angle of taper.

Where taper checking is a frequent item, a self-contained fixture of the type shown in Fig. 2 will be found more convenient. Here, one of the parallels is fixed; the other, with buttons, is adjustable and can be fixed at any inclination and spacing to suit the taper under test. In order not to increase dimesions D and d unduly, the fixed parallel has a ledge machined in it. It is ground and lapped exactly parallel to the inside face of the block and all measurements are taken from this ledge to the outside of the button, especially when a micrometer is used. If gage blocks are used, it will be found easier to measure from the inside face of the fixed parallel to the inside face of the buttons. Since neither the diameter of the buttons nor the thickness of the ledge enter into the calculations, they may be of any size, as small as practicable. The ledge, of course, is an optional feature and may be omitted.

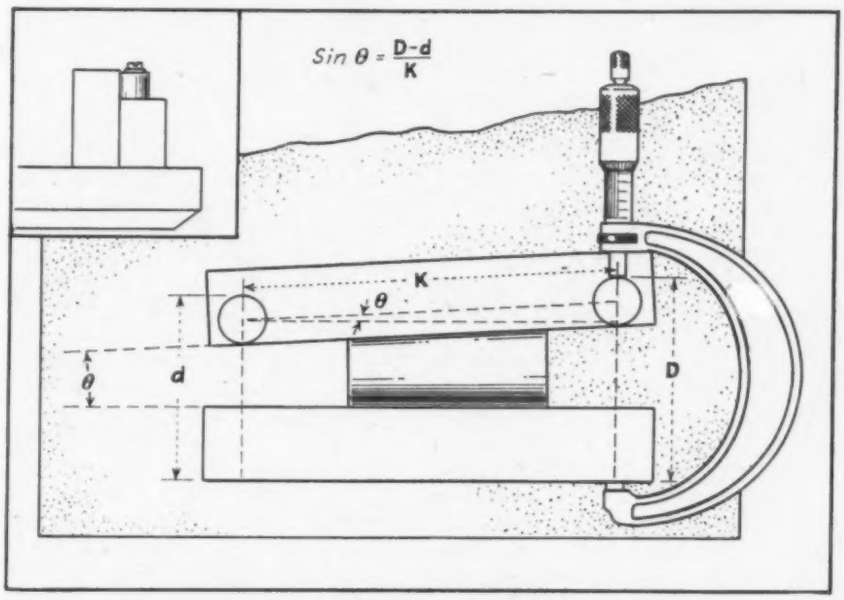


Fig. 1—Buttons fixed on edge of thinner parallel are set with higher parallel (inset). Mike measures taper directly

These are the advantages of the method:

(a) The arrangement and manipulation being simple, a worker of average skill can make the measurement.

(b) Measurements can be made using either precision gage blocks or a micrometer (or even a vernier caliper). This is an important gain inasmuch as the micrometer being the commonest and most extensively used of all precision measuring instruments, the facility for precision taper checking is greatly extended. An added advantage is the speed with which results can be established. No time is lost in setting up the work, or in trying out various combinations of gage blocks (necessarily a slow process) or in indicating the work; just direct miking of the dimensions D and d is all. A drawback of micrometers is that they lack the absoluteness of gage blocks and, now and again, have to be set against reference standards, especially when readings are by tenthousandths. But with the above method, the object can in most cases be so disposed between the parallels that dimensions D and d both fall within the range of a single micrometer. Then any constant error of the instrument will affect D and d equally and will be eliminated in the result (D-d).

(c) Even when gage blocks are

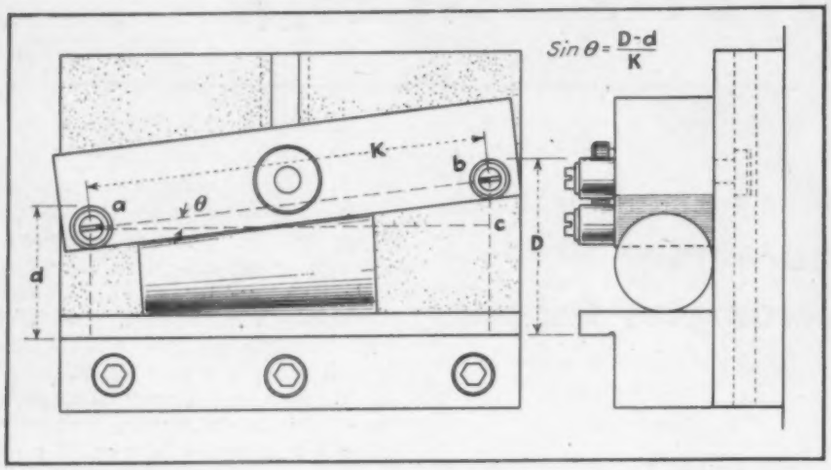


Fig. 2—Same in principle to setup of Fig. 1, this fixture makes frequent taper measurements and comparisons faster

used, the object doesn't have to be precariously perched atop a sine bar which itself has to hang on at an oblique angle to the pile of slippery gages, as in conventional practice; instead, it rests securely on a surface plate between two blocks; this makes for ease and convenience in working; it also eliminates risk of accidental damage to tools or work, owing to the inherent stability of the setup.

(d) When the object is large and heavy, no elaborate heavy-duty sine bar fixture is necessary to support it. The parallels, provided their height is more than the maximum radius of the objects to be encountered, can take care of any size of object.

(e) For increased accuracy, parallels of any length can be used with advantage, to set the buttons farther apart than 5 in. or 10 in.; there is no chance of error through deflection of the long bars because the parallels rest along their full length of a flat surface (not on two points only); besides, they carry no load.

(f) In conventional practice, the

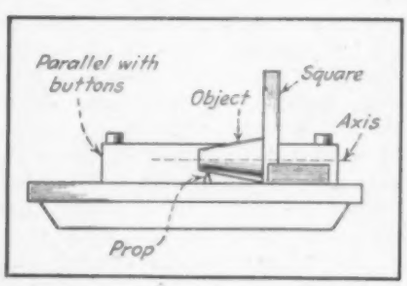


Fig. 3—Steep tapers should be leveled approximately for accuracy

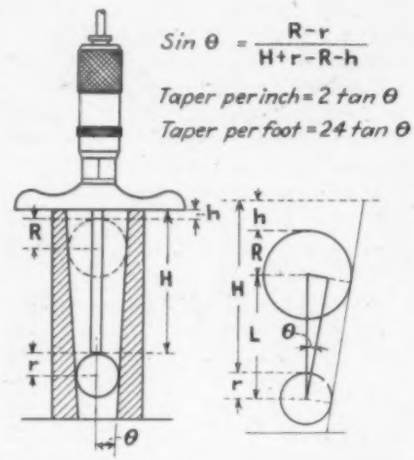


Fig. 4—Simplest internal measuring employs depth gage and two balls

precision gage blocks are made to carry most of the weight of the sine bar and work. The above procedure is free from this undesirable feature.

The tapers which are encountered most frequently in engineering practice are what are called "self-holding." All the standard Morse, B & S and Jarno tapers are such; so also are all American Standard Machine Tapers and American & British standards for steel taper pins. In all cases the included angle of taper is less than 3°, except the 3½° of some A S T M tapers and 3° and 46 odd minutes of Morse No. 5. Now if the simple sine formula is to apply, as stated before, theory requires that the axis of the tapered object, when it is held between the bars, should be parallel to the plane of the surface plate. An example will show why this theoretical dictum may be disregarded for the "self-holding" tapers. If an object having an angle of taper of exactly 3° (taper per inch = 0.0523718 in.) were laid directly on the surface plate, its axis will be out of level by as much as 1°—30 ft. Yet, if its taper is measured by the above method, without correcting the level of the axis, the value obtained would be, again theoretically, 0.0523898, an error of less than twenty millionths of an inch!

For higher tapers, such as the "self-releasing" ones found on milling machine arbors, (angle of taper 16°) and others, it is sufficient to level the axis approximately. This can be done within a half degree or less, by propping the smaller end of the taper until its side aligns vertically with the blade of a square as shown in Fig 3. This will provide ample accuracy even in case of very high tapers, obviating the need for holding work on centers.

In any case, the alternative is always there of laying all tapered work directly on the surface plate, finding their apparent taper using the sine formula, and then computing the exact taper to any degree of accuracy, with the aid of additional figure work. I have omitted details of this aspect as being of dubious value from a practical point of view.

Internal Taper Measurement

Internal tapers do not lend themselves to precise measurements as easily as external tapers, and the general practice is to use a taper plug to test them. If the taper is a standard one, a taper plug may be available; but if it is not available,

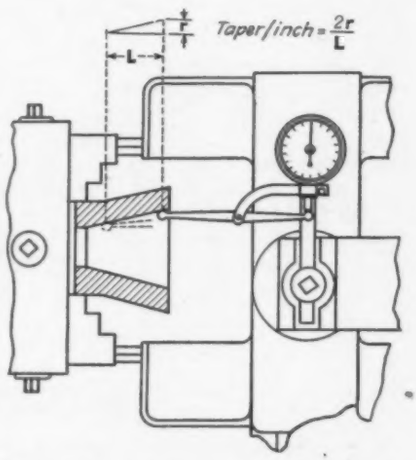
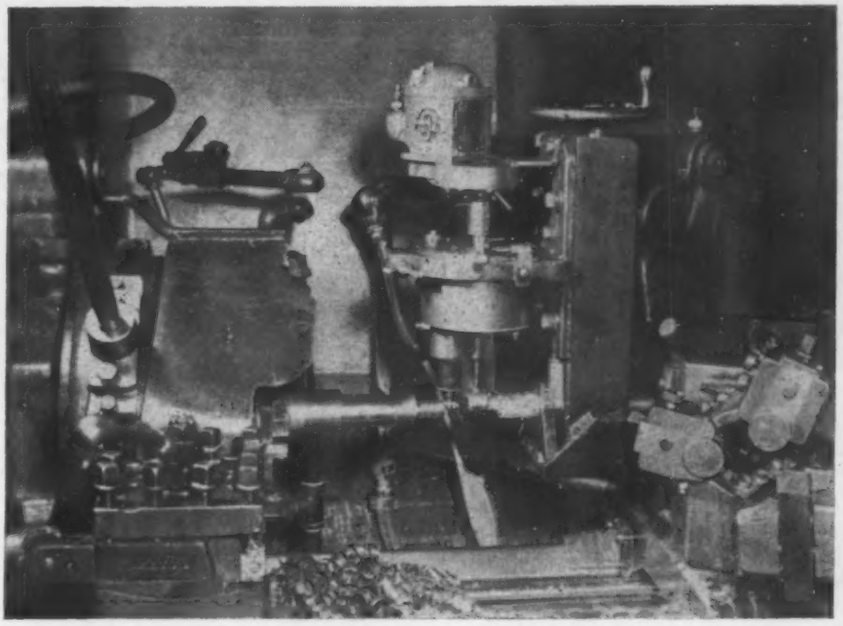


Fig. 5—For lathe work, use dial indicator with extension feeler

or if the taper happens to be an odd one, the problem may look well nigh unsolvable by standard methods.

Provided balls of suitable sizes are available, the method described here is a fairly simple one and is capable of giving good results. Two ball bearing balls of known radii and a depth gage are required. One ball should be small enough to reach almost to the bottom of the taper; the other, large enough to stop near the top. With the small ball in, its distance H from the top of the taper is measured with the depth gauge. Next, distance H of the large ball is measured in a like manner. The taper or the angle of taper is then found by solving the easy equation and referring to trig tables.

Internal tapers can also be measured by chucking them true on a tool room lathe and taking readings using a dial gage setup as illustrated. See that the compound slide is set at right angles to the cross-feed. With the feeler point just touching the taper near its large diameter, readings of the dial gage and the compound slide micrometer are noted. The compound slide is then advanced a definite distance L (as measured by its micrometer) so that the feeler point is as far in towards the smaller end of the taper as it would go. The change in the dial indicator reading will give the dimension r. Taper per inch is then twice r divided by L. As a check on this result, the compound and cross-feed micrometers may be used to determine L and r respectively. After insuring that the compound slide is at right angles to the cross feed, move compound to left till the feeler point is as far in as possible. Back off the compound a little to take up back lash and advance the cross feed until the feeler point contacts the taper. Set dial gage to zero and note reading of compound and cross feed micrometers. The compound may now be moved to the right definite distance L, and the cross feed may be advanced till the dial gage again reads zero. L and r of course are then given by the differences in the initial and final readings of the compound slide micrometer and cross feed micrometer, respectively. Care should be taken to see that all readings are taken with the screws traveling in the same direction, thereby eliminating the effect of back lash.



Air motor, bracketed to lathe turret with a vertical feed attachment, permits keyseating and cotter-pin hole drilling without removing work

Pneumatic Drill And Mill Runs On Lathe Turret

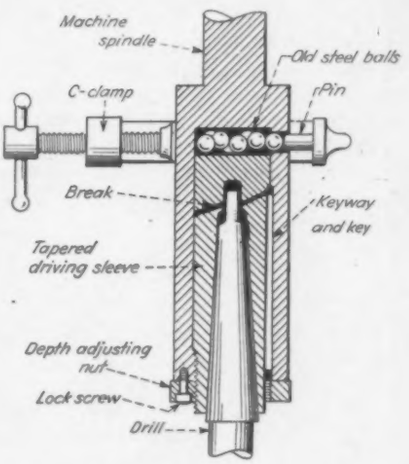
HILLERY FOX
West Chester, Pa.

Machining our large axle spindles formerly required three separate machine setups. The turret lathe did only the turning; a miller was used for the keyways and a drillpress for the cotter-pin holes.

Now, with a heavy bracket fastened in one of the turret stations, the keyseating and drilling are accomplished with a single standard pneumatic tool fitted with a special two-spindle head, and the shaft is completed without removing it from the turret lathe.

The two-speed head is a simple gearbox providing a direct drive for the drill and about 4 to 1 reduction for the milling cutter. The position of the unit is such that the keyway can be cut along the back side of the shaft (with lathe spindle stationary, of course) and the drill, though turning, won't interfere. This is accomplished with the turret feed. Drilling the cotter-pin holes lines up the drill but puts the cutter out of the way and vertical feed is obtained with a short leadscrew. The air motor is fitted with a quick-action hose connection so it can be removed easily for storage when not in use.

Removing Broken Sleeves—In one of the spindles of a multiple spindle drilling machine, a broken sleeve proved very difficult to remove. The material was too hard to be drilled and tapped for a drawbolt; instead, I drilled a ¼-in. hole through the



side of the spindle near the base of the socket and filled the cavity with old ¼-in. ball bearings and then forced more bearings in with a C-clamp and pin. Every time I drove a ball in the broken part came down a little way. Although it took 6 or 7 dozen balls to force the part out, the job was accomplished in a few minutes. *J. A. Raught, Racine, Wisconsin.*

Inserted-Bit Milling Cutter Is Easy To Make And Maintain

STANLEY STARK
Chisholm, Minnesota

Here is a low-cost face mill made to use high-speed tool steel such as Rex A.A.A. which I am using. I made the face mill to fit the new Cincinnati No. 4 Universal Miller spindle nose though other adaptations could be made for other millers without the new N.M.T.B.A. 1938 standard.

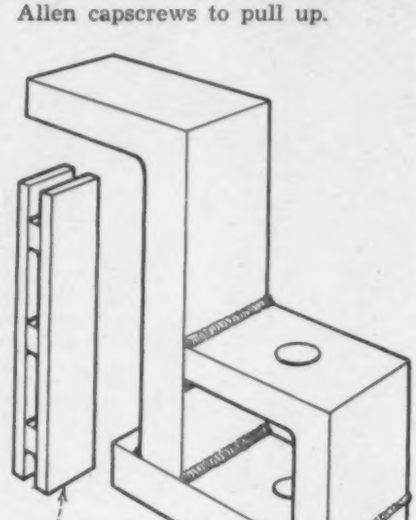
The rake angle is ground on the tool steel pieces before they are inserted. When the tool steel pieces are in position and tightened down with the Allen setscrews they are ground to length and diameter, then secondary and primary clearances are ground. I used a rake angle of approximately 10°, secondary angle of 30° and primary angle of 5°. Angles could be changed to suit as needed.

One of the features of this cutter is the ability to hold a constant outside diameter even after regrinding the toolbits, because of the angle of the slots holding the tool steel cutters. Behind each tool insert is an Allen setscrew for adjusting.

This cutter can easily be made in any shop that has a milling machine, engine lathe and a universal tool and cutter grinder.

When milling the slots on the body, set it between dividing head and tailstock center using round head instead of standard pointed centers. These round head centers will enable the indexing to be done without trouble.

There should be a very good fit between the cap and the body and and a small allowance for the four Allen capscrews to pull up.



Offset Straps

H. B. ODELL
Toronto, Ontario, Canada

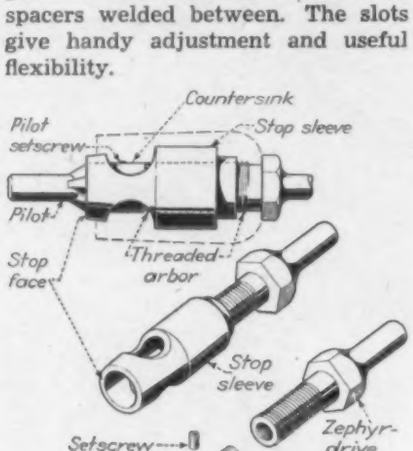
The piece of steel with a hole or two in the length of it, called a strap, is one of the most common machine shop accessories. Sometimes it would be very handy to keep the height of the projecting bolt head and the nut lower than the surface being worked on.

Such a strap was devised from a couple of pieces of angle, and an analysis of the forces will show this construction is very useful. Not requiring blocking, it also becomes a time-saver.

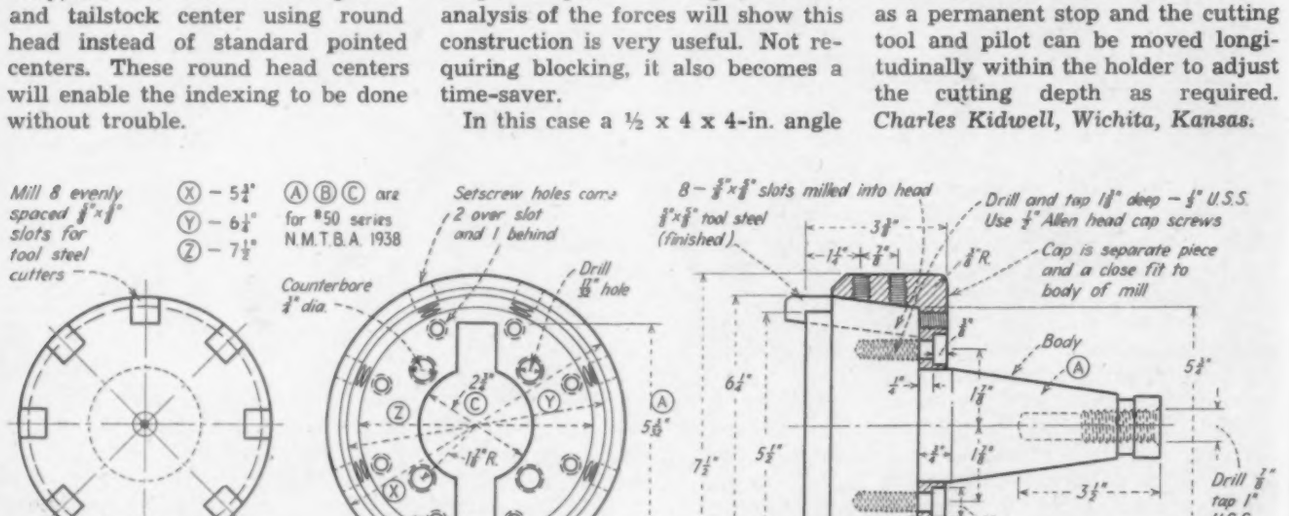
In this case a ½ x 4 x 4-in. angle was cut 2-in. wide. One of the 4-in. legs was cut to 2-inches. The bottom plate is ½ x 2-in., and the short inner projection is to allow the fillet in the angle iron to clear. A ⅜ x 1½-in. angle piece welded, an 11/16-in. hole drilled for the bolt to pass through, completes the clamp.

The idea permits a wide range of sizes around the same basic construction.

Another type strap not often seen, but easily made, is devised from two pieces of bar stock with two or more spacers welded between. The slots give handy adjustment and useful flexibility.



Piloted Countersink—By a simple adaptation, the standard "Zepher-Drive" holder has been used to countersink holes to pre-set depth. The face on the end of a holder acts as a permanent stop and the cutting tool and pilot can be moved longitudinally within the holder to adjust the cutting depth as required. *Charles Kidwell, Wichita, Kansas.*

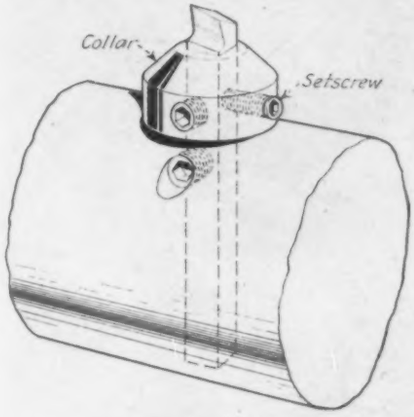

Mill 8 evenly spaced ⅜"x⅜" slots for tool steel cutters
Ⓧ – 5¼"
Ⓨ – 6¼"
Ⓩ – 7½"
ⒶⒷⒸ are for #50 series N.M.T.B.A. 1938
Setscrew holes come 2 over slot and 1 behind
Counterbore ¼" dia.
Drill ½" hole
1 setscrew behind each piece of tool steel
2 setscrews to come over tool steel slots
BODY
⅜" U.S.S. Drill and tap 24 holes
1.018
Driving slots
CAP
8 – ⅜"x⅜" slots milled into head
⅜"x⅜" tool steel (finished)
Drill and tap 1⅛" deep – ½" U.S.S. Use ½" Allen head cap screws
Cap is separate piece and a close fit to body of mill
Body
Drill ⅞" tap 1" U.S.S.
Drill and tap over tool slots and directly behind (24 holes). ½" U.S.S. for Allen safety setscrews
Ⓐ Milling machine spindle taper standard for above #50 series N.M.T.B.A. 1938 or make to fit other series or standards. Driving slots in cap are not shown above

Collar Keeps Record of Boring Tool Settings

A. F. SCOBLIC
Milwaukee, Wisconsin

The tool consists of a round collar, bored out for a slip fit over the boring tool and tapped for a setscrew. Three collars were made, having 1, 2 and 3 scratches, respectively, to designate the sequence of their use.

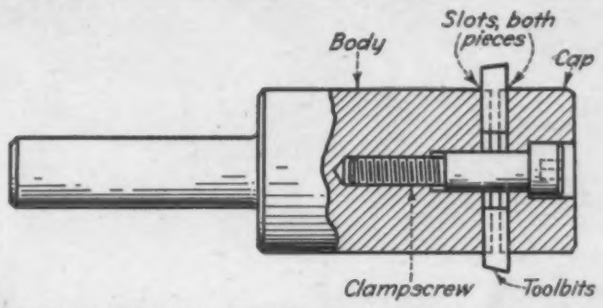
The collar is placed on the tool and tightened, after the correct size has been obtained with the tool. The



Cutting diameter is fixed by collar

collar remains on the tool for the rest of the pieces to be machined. As each successive work piece is begun, the proper tool is inserted into the boring bar. No trial cuts are necessary. Duplicate bores and similar work pieces may thus be made in rapid succession without the customary adjusting of tools for each time a tool is set.

When a tool requires grinding, it is touched up with the collar left on. This will, of course, produce a smaller bore according to the amount removed from the tool. A trial cut is first made with the tool inserted in the boring bar, as before. The bore size is checked. We will assume that the bore is 0.020 in. small, on the trial cut. The tool is then loosened in the bar and a 0.010 in. feeler is placed between the surface of the bar and the under side of the collar. The tool is tightened in the boring bar, which brings it back to its correct setting. The collar is loosened and dropped to the surface of the bar where it is again tightened. The tool is thus set for duplicate bores until regrinding is again necessary.



Boring Bar—Double bit boring bar is easily adjusted by loosening end capscrew slightly and tapping bits with soft hammer. Bits can be driven out with a small wedge drift. Slots in bar body and in cap hold bits and cap in secure alignment. *Frank J. Peragine, Brooklyn, N. Y.*

Wooden Base Positions Milling Attachments

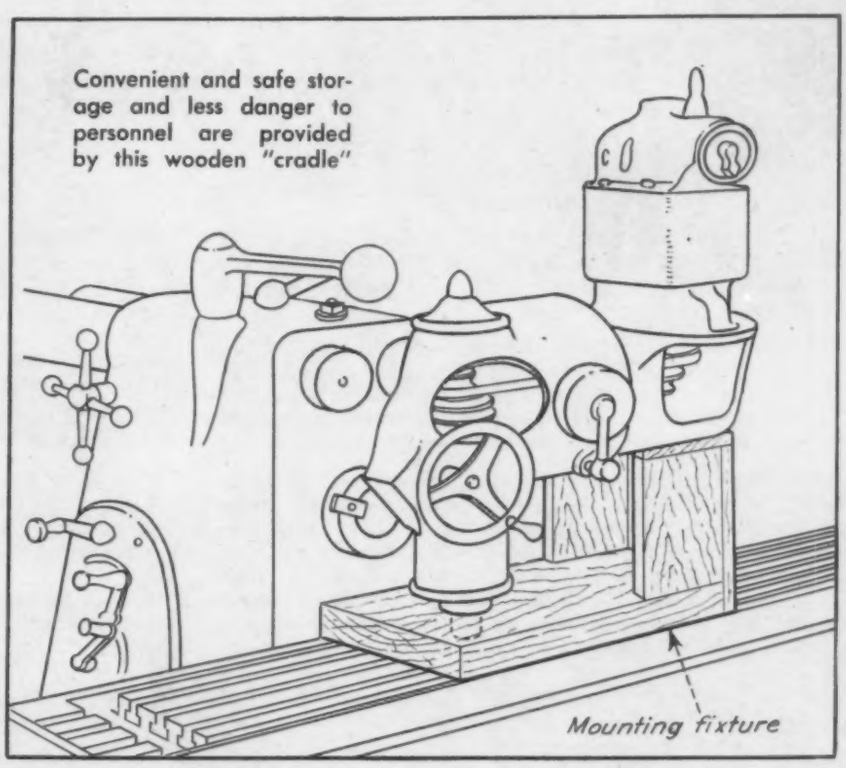
FRITZ L. KELLER
Bloomfield, N. J.

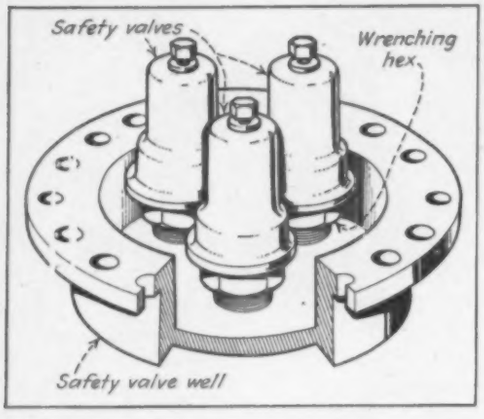
In recent years, vertical milling machine attachments have become more and more popular but one of the main difficulties seems to be mounting and removing from the machine, due to the weight and awkward hard-to-handle shape. Often it took two or three men to get the attachment on or off the machine.

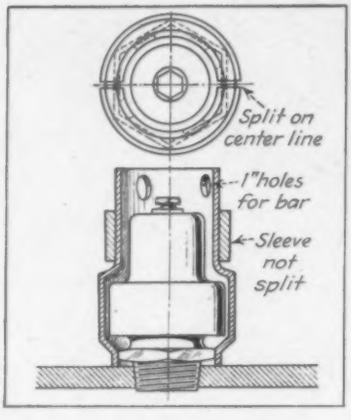
This work has been simplified since we built this base, which holds the attachment in the ready-to-mount position. Now it is merely necessary to place the base with the attachment on the milling machine table, raise it to proper height to engage the arbor support rod of the machine, and engage the rod into the attachment.

The base is made from wood and is provided with a hole through the center of the board to fit the nose of the spindle and the motor end is provided with a support to bring the attachment level when at rest. When the attachment is removed, the base goes with it and is placed in an easy to get at position.

Convenient and safe storage and less danger to personnel are provided by this wooden "cradle"







Recessed safety valves on modern locomotives can't be removed with standard wrenches. Compare this to auto spark plug wrench

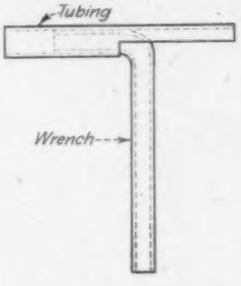
Split-Barrel Wrench Does Difficult Job

H. W. SHEPARD

A barrel wrench, split lengthwise and provided with a sleeve of substantial proportions to slip over part of it and hold the two halves together after they have been put in place, is a very effective tool to remove hard-to-get-at valves and fittings. Such a wrench is needed in the railroad shop to remove and apply the safety valves of many modern locomotives, and the idea of a split-barrel wrench has applications in other fields.

To keep within the right-of-way clearance limits, it is necessary on large locomotives to use a recessed steam dome. The safety valves or "pops," as they are often called, screw in the recessed portion of the dome. They have a hex portion above the threaded part and above the hex is an enlarged cylindrical section that houses the valve. This bulge prevents the use of an ordinary barrel wrench; the three pops are nested close together in the recessed dome cap and no ordinary wrench can be used effectively.

Since these valves must be frequently removed for rapairs or to plug the holes where they screw when putting a hydrostatic test on the boiler, a special wrench is a necessity. This split barrel wrench was designed after unsuccessful attempts to use a crow-foot wrench.



T-Handle—It is sometimes handy to have a T-handle for hex-socket setscrew wrenches especially when the long part of the wrench is needed to reach the screw. Taking a piece of tubing or pipe, split it half way down and cut away half of the split part. The tubing can be a snug fit for the wrench required or large enough to be used on several wrench sizes. *Neils C. Thomsen, Denver, Colorado.*

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(in addition to regular payment for all exclusive contributions published)

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Twenty-eighth Selection—Earl R. Goddard's Hints on Small Tools

Specific Industries Show German Production Problems

This final of two reports on the metalworking situation in Germany deals with specific key industries. It indicates the scope of problems confronting Allied authorities. Photos show production operations on the Volkswagen, only passenger car produced since the war

BY JOHN CHRISTIE, BERLIN BUREAU, McGRAW-HILL WORLD NEWS

Volkswagen Production Plant—Hitler's famous "People's" car rolled off assembly lines at Fallersleben at the rate of 10,685 units during 1946

BERLIN — Metalworking industries figure prominently in the complex and bewildering task of managing and demilitarizing the German industrial system. Aside from production limitations, based on the 1949 level of industry plan, industry generally has been plagued by acute shortages of essential materials and power facilities.

With the closing of a very severe winter, supply lines might flow easier, but observers close to the economic situation are convinced it will take years before production can approach permitted levels. Revamping of the 1949 level of industry plan is held essential to remove many conflicting and ambiguous phases that have hampered operations.

A review of the economic chaos and uncertainty which prevails in Germany was presented in the April 24 issue of AMERICAN MACHINIST, pg. 117-120. The passenger car, motor truck, agricultural machinery, tractor, and locomotive and rolling stock industries are singled out for special discussion in this article to show the effect of production problems.

Passenger Cars—The Volkswagen is the only passenger car to be produced in Germany since the end of the war, and only 10,685 of Hitler's famous "People's" cars rolled off the assembly line at Fallersleben in the British zone in 1946. It was not until December 1946, that British military government's requirements had been met sufficiently to make a limited number of Volkswagens available for American purchasers in Germany.

There are no immediate plans for selling the cars to Germans on the open market. Furthermore, the British would rather sell them for dollars or pounds until the German mark has value.

The Opel plant in Russelheim, U. S. zone, gave the pilot model of the Opel Olympia, a four-cylinder, two-door sedan, a test run on Feb. 22. However, U. S. military government is planning to give production priority to the six-cylinder four-door Opel, known as the Kapitaen, which duplicates the Chevrolet to the extent that about 75% of the parts are interchangeable.

Reason for favoring the heavier model is that production will require less tooling. Furthermore, the cars initially will be for American and Allied consumption, and it is felt the larger model will be more in demand. Production of the smaller model probably will be withheld until the possibility of a German or European market is in sight.

Because of the gasoline shortage and generally adverse economic conditions destined to prevail for a number of years in Germany, emphasis is certain to be placed on the small four-cylinder rather than the large luxury-type model. This trend is already evident in France.

Production Being Resumed

The Ford plant at Cologne, which has been turning out trucks, probably will not be ready for passenger car production before summer. Ford bodies pre-war were made by Ambi-Budd in Berlin. The Russians took a lot of the equipment out of this plant in the early days of the city's occupancy but fortunately left the dies and most of the other necessary body-building equipment. Ford has been having the dies moved to the Cologne area but it is a slow, tedious job under present conditions. Ninety percent of Ford's passenger car production will be the four-cylinder European model.

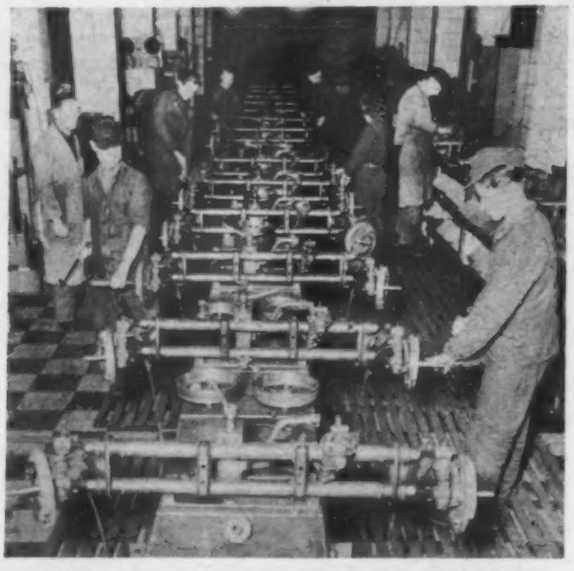
Production in all cases is being resumed with pre-war designs and no new models are planned for the immediate future because of the difficulty of retooling. The chief concern for the present is to produce sufficient cars for the requirements of the military and the vital civilian needs which it approves.

Under the 1949 level of industry plan, passenger car production is limited to 40,000 units per year. This represents only 16% of the 245,000 passenger car output in 1936. No one seriously believes this figure will stand. It will be some time, however, before the domestic market is anywhere near normal. There are no immediate plans for promoting exports, because neighboring European

A SPECIAL American Machinist FOREIGN REPORT

The Volkswagen is the only passenger car which has rolled off German assembly lines since the close of the war. Some typical production and assembly operations on the Volkswagen are depicted in this series of photos made at the Fallersleben plant in the British zone

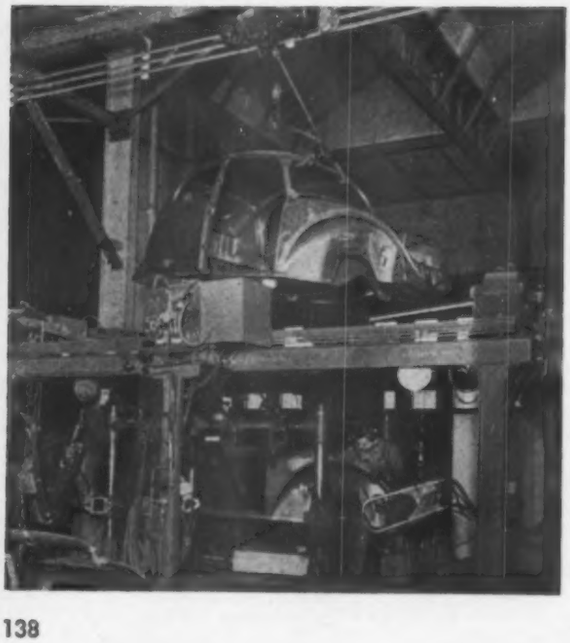
Left: Engine assembly line



Right: Front axle assembly line

Final assembly of engine to axles

Body assembly line



Left: Bodies in fixtures

Right: Fitting body to chassis

countries would be unlikely to part with precious dollar or sterling balances for cars in view of their dire need for capital goods for reconstruction.

Motor Trucks—The output of trucks, although amounting to only 34% of the permitted 40,000 per year level, has been pushed as much as critical power and raw material shortages would allow because of the need for load-carrying vehicles for reconstruction work. Also, the end of the war found municipalities critically short of trucks for vital public services.

Contributing to production in the British zone are the Ford plant at Cologne with medium-sized trucks, Bussing with five-ton vehicles, and Vidal and Sohn near Hamburg, makers of the small three-wheel vans which have become an amusing feature of the German postwar scene.

Retooling Restricted

In the U. S. zone, Opel is making its standard one-and-a-half-ton truck. Daimler-Benz is also making an Opel model. This is a three-ton truck, which under pressure of war conditions had to be made at the Daimler-Benz plant. Military government did not want the plant to retool under present conditions and instructed it to continue using the Opel patents. A Daimler-Benz plant in the French zone is making three-ton trucks.

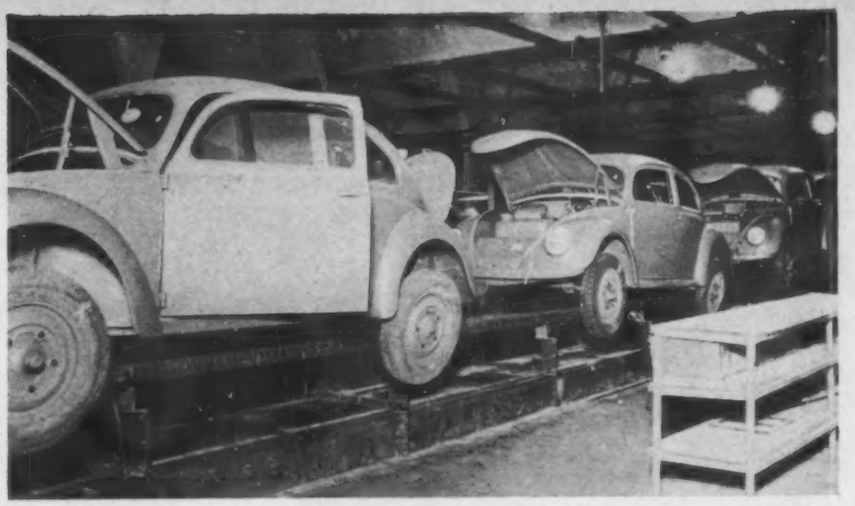
The industry has run into a number of difficulties because of its traditional dependence on a large number of suppliers. The Ford plant, for example, prewar dealt with some 600 German suppliers. This number has now been reduced to 350.

Bottlenecks Hinder Output

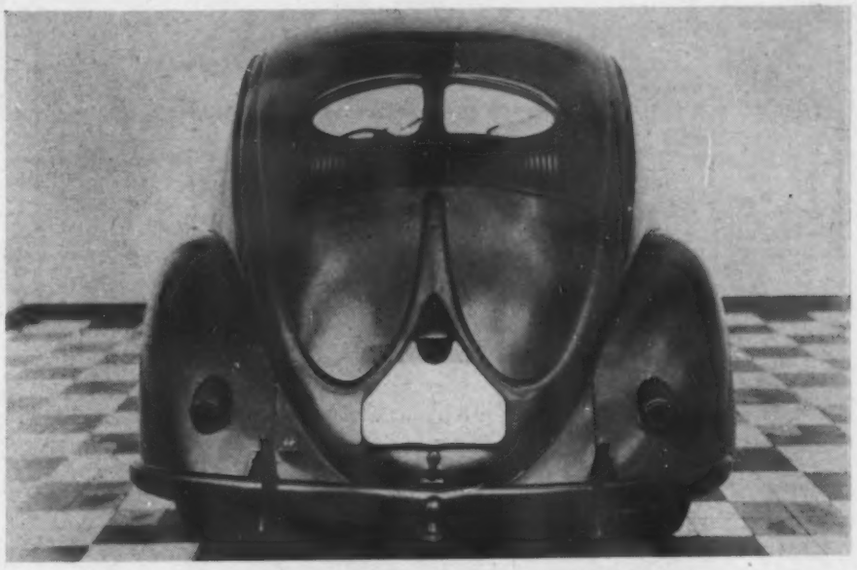
Suppliers in the Russian zone have been written off because zonal barriers, particularly between east and west, have discouraged attempts to resume business on a normal basis. The shortage of steel and coal makes production of parts highly uncertain at best. Tire production until recently has been a serious bottleneck because of dependence on buna. Now, however, the British are bringing in increasing supplies of rubber from the Colonies.

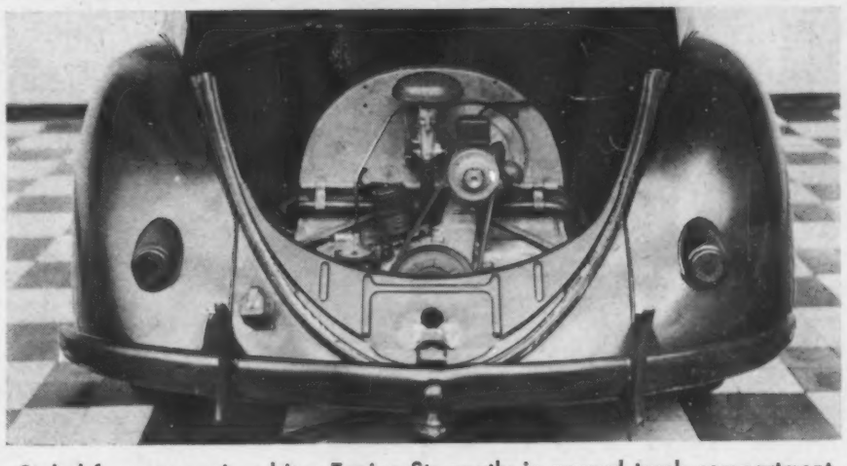
The 40,000 per year ceiling placed on production of commercial vehicles under the 1949 level of industry plan represents 67% of the 1936 output of 59,000. Use of the term "commercial vehicle" is ambiguous in that it makes no special provision for busses and such vehicles as fire engines and ambulances.

Agricultural Machinery—The 1949 level of industry plan placed no limit on farm machinery other than agricultural tractors. The occupying powers decided that the existing



Final assembly line





Styled for rear-engine drive. Engine fits neatly in normal trunk compartment

Finished Volkswagen which British hope to sell for American dollars or British pounds until the value of German marks stabilize

ANNUAL PRODUCTION QUOTAS COMPARED WITH ACTUAL 1946 OUTPUT

(Units)

Industry, Production Quotas & Production Achieved	Zones				Total
	British	French	U.S.	Russian	
Rail Passenger Coaches					
Production Quota	565	Nil	565	220	1,350
1946 Total	2				2
Rail Freight Cars					
Production Quota	12,650	4,200	6,325	7,225	30,400
1946 Total	106	12		1,000	1,118
Road Tractors					
Production Quota	1,500	Nil	2,500	Nil	4,000
1946 Total	308		1,353		1,661
Motor Trucks					
Production Quota	21,000	2,000	17,000	Nil	40,000
1946 Total	9,428	522	3,670		13,620
Passenger Cars					
Production Quota	20,000	Nil	20,000	Nil	40,000
1946 Total	10,685				10,685
Agricultural Tractors					
Production Quota	3,850	500	4,650	1,000	10,000
1946 Total	1,714	336	1,072		3,122

80% of 1938 capacity should be retained, subject to restrictions on type and power of equipment which may be produced.

The American and British zones contained 67% of the farm machinery producing capacity. War damage to a certain number of plants has been made up to some extent by other industrial plants, which have tooled up for this type of production because of its favorable standing and present production priority.

Mechanization of farming was promoted considerably in Germany during the years 1933 to 1938. Prior to the war Germany had considerable excess capacity to supply foreign markets with all types of farm machinery except dairy machines, of which she was an importer. In 1936, about 35,000 were employed in this industry as compared to 46,000 in 1942.

Prior to the war, wood was used extensively in the manufacture of farm machinery. War conditions, however, tended to force all-steel construction.

Tractors—The production of agricultural tractors is limited to 10,000 units per year under the 1949 level of industry plan. This compares favorably with the 1936 production of 13,900 units. The limit of 35 hp. is considered no detriment because of the suitability of light tractors for European farming conditions anyway. Only prewar designs are being produced and these are considered backward probably because of the fact little attention was paid to improving agricultural equipment after 1938 because of the pressure of war work.

The 1949 level for road tractors is 4,000 units and size is limited to 35 hp.

Locomotives and Rolling Stock—The question of how many main-line locomotives Germany should produce in a year has been left open. The 1949 level of industry plan directed that available plant capacity be used for repair of locomotives to the end that a pool of 15,000 be built up by the end of 1949. This arrangement is satisfactory under present conditions.

The number of repairable locomotives is adequate to present transportation needs. Shortage of power and raw materials makes it difficult to keep abreast of even the repair program. Despite high priority and extensive cannibalizing of damaged equipment, Germany produced 285 main-line locomotives in 1936.

In the case of rolling stock, the emphasis also has been on repair. Only 4% of the permitted annual production of 30,400 freight cars was chalked up for 1946. Of the permitted 1350 passenger coaches, only two were manufactured.

While views expressed on the 1949 plan by various committees of the Allied Control Council do not represent the official position of the respective powers, and although many of the controversial issues will be resolved anyway as a result of certain high-level political decisions, the points brought up in this round-up of German metalworking indicate the enormity of production considerations for conquered Germany.

Hitler Set Design Specifications For Volkswagen, Worden Reports

WASHINGTON — Interesting views on German automotive production, particularly the Volkswagen, have been made by Lloyd D. Worden, chief of the automotive and aeronautics unit of the Office of Technical Services, Department of Commerce.

Summarizing developments in the automotive field, Mr. Worden said Hitler ordered the Volkswagen designed in February 1936, specifying that it should be made to sell for less than 1,000 Reichmarks ($400) and that it must have long life, low maintenance, and other desirable characteristics. Dr. Robert Porsche, engineer in charge, designed a car that met specifications.

Air-cooled Engine

The Volkswagen is a two-door coach for four adults and one child. It has a four-cylinder air-cooled engine located in the rear. The engine develops 23.5 hp. at 3,000 revolutions per min. The car has a 94-in. wheelbase and is about 14 ft. long. Luggage space and tire carrier are located in front. All four wheels have independent torsion-bar spring suspension.

Mr. Worden said the Fallersleben plant was scheduled to turn out 1,000 cars a day just before war broke out. After war began, the Volkswagen became the German "Jeep," for land and amphibian use.

Chassis Frame Differs

The Volkswagen has no chassis frame in the usual sense, according to Mr. Worden. Instead, the power plant and body are assembled on a platform of pressed steel, with a welded-on tube through the center to carry the controls. This construction makes the car very sturdy for its weight, which is about 1,500 lb.

In speaking before the American Society of Body Engineers in Detroit, Mr. Worden described other German equipment for the automotive industry, including the Lindner jig-borer, capable of tolerances of 1,400,-000 in.; a precision grinder with which the operator can translate a drawing directly into metal, thus making hand work on templets unnecessary; and a profile milling machine designed by Messerschmitt and used to produce the exact contours of a model in a block of hard wood or light metal. The grinder has a lens which magnifies the grinding wheel and work surface by 40 times. Direct profiling from a metal draft, such as is possible with the Messerschmitt milling machine, has never been used in American industry.

He urged American automotive engineers to cooperate with the Office of Technical Services in evaluating technical information brought back from Germany.

NEWS OF METALWORKING

Machine Tool Show Space Rescanned To Meet Flood of Exhibit Requests

CLEVELAND—The executive staff of the National Machine Tool Builders Association is rescanning every one of the 500,000 sq. ft. of floor space at the Dodge-Chicago plant to meet an unexpected crush of last-minute requests from industrial firms for exhibit space at the 1947 Machine Tool Show to be held Sept. 17-26. The staff is composed of Tell Berna, general manager, Frida F. Selbert, secretary, and Alvin L. Krieg, assistant to Mr. Berna.

For the most part, accessory supply firms are causing the last-minute space confusion, and while efforts are being made to take care of delayed requests, some might be rejected for lack of space. Machine tool builders were quick in making known their desires for space. Exhibit space is only open to association members, publications, and firms supplying accessories to the machine tool industry.

Attendance Estimate Increased

Reservation returns from industrialists, engineers, and tool dealers from foreign lands indicate the 1947 show will attract more than 100,000 persons, an initial estimate. Previous shows were staged in Cleveland in 1927, 1929 and 1935.

Actual attendance promotion started in mid-March with attractive folders going overseas for distribution to machine tool dealers and builders. The folders included reservation forms, hotel information, etc.

Seven days after the first overseas folder was mailed, an advance registration was received in the Cleveland office from a London industrialist. Mr. Berna cited it as a record for such returns. Other returns have since come from virtually all European countries as well as Australia, New Zealand, So. America. Exhibtors received forms for listing personnel to be at the show and hotel preference. Hotel accommodations can be made from Aug. 25—the date installation of exhibits gets underway—until Oct. 10, when exhibits will be dismantled.

This month, the association began mailing domestic folders titled, "What You Should Know About the Machine Tool Show." It contains pertinent information relating to the show, its location in Chicago, the extent of the show's exhibits, hotel reservation forms, and advanced registration cards.

Domestic folders are being distributed through machine tool builders, dealers and sales representatives throughout this country and Canada. Admission to the show will be by invitation only, with a nominal registration fee of $1 to assist in curtailing the expense of services.

Registration Cards Pour In

Advance registration cards are being received at the Cleveland office from domestic visitors. Upon registering, individuals are sent cards for badge purposes. Overseas visitors will wear red badges, domestic visitors will use blue badges, and exhibitors and other show personnel will wear badges of other colors.

A complete schedule of the association's advertising in news and trade publications, together with copies of other ads to be inserted, went out to exhibitors early this month. Exhibitors have been urged to tie in their own individual ad copy with that of the association in promoting the show. Publicity has started to flow from the association offices and this will be increased in tempo as the show approaches.

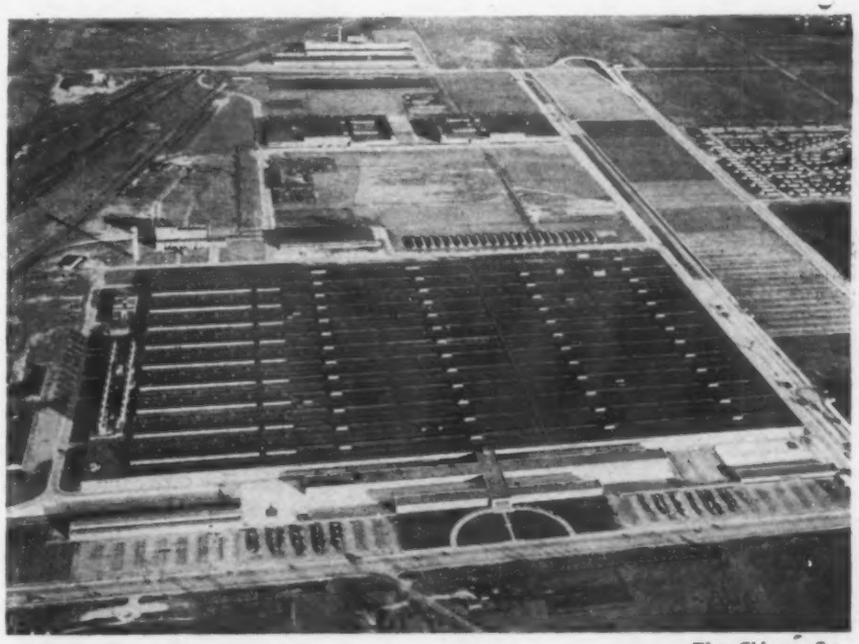
Exhibitors will receive three-fold folders entitled "Will You Be Here?" Exhibitors and others interested in the show's success are expected to use the promotion pieces in their mail.

Letterhead stickers are ready to be sent to exhibitors and their sales representatives. These will be placed on each piece of outgoing mail. Bearing the show's official insignia, the stickers ploclaim "Machine Tool Show—Chicago—Sept. 17-26.

Exhibit Space Doubled

The list of exhibitors will not be available until sometime next month, but the executive staff gives assurance that every inch of space—double the amount available for any previous machine tool show—will be occupied when the show opens.

Concurrently with the show, the Machine Tool Congress will hold nightly sessions at which ranking authorities in metalworking industries will present papers and reports covering the outstanding developments in techniques and processes.



The Chicago Sun

Exhibit Space At A Premium—This is the site of the 1947 Machine Tool Show, the Dodge-Chicago plant in Chicago. With 500,000 sq. ft. of show space available, a flood of requests for space has made necessary a complete rearrangement of space assignments. The interest and enthusiasm engendered by the show has been demonstrated by advance foreign and domestic reservations

Gaging Business

New Orders Slacken

Metalworking companies are continuing to run at or near capacity, but signs are multiplying that caution should be the order of the day. New orders have slowed down, more firms are finding it desirable to quote firm prices and efforts are being made to reduce inventories. Materials are beginning to ease, though the situation remains critical in copper and in certain steel products. The recession which has hit soft-goods lines has not extended noticeably into metal durable goods. It is true, however, that business is not uniformly as healthy as it was in all branches of metalworking. Spotty conditions exist, especially in the machine tool industry.

Equipment Makers in Bad Spot

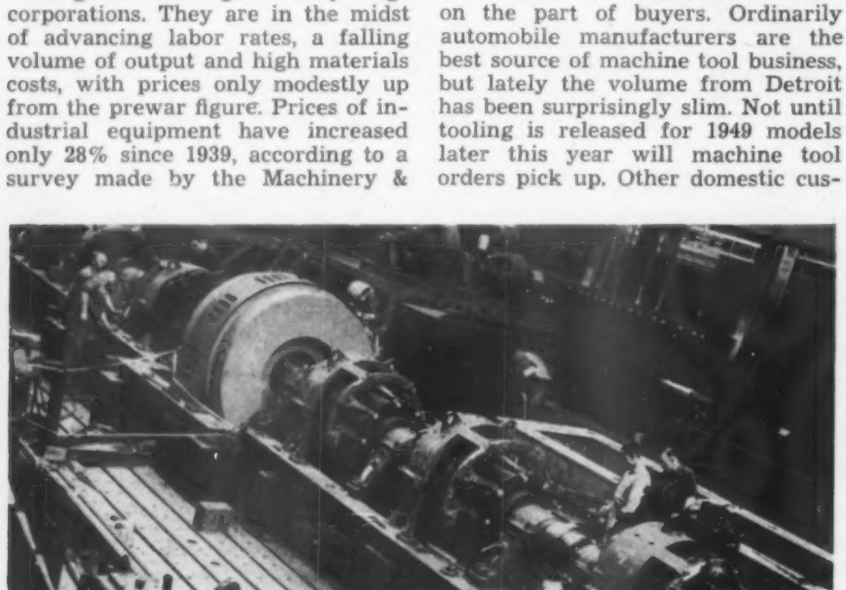
Machinery builders, most of whom operate relatively small businesses, find themselves caught in a bad position as a result of the second round of wage increases granted by large corporations. They are in the midst of advancing labor rates, a falling volume of output and high materials costs, with prices only modestly up from the prewar figure. Prices of industrial equipment have increased only 28% since 1939, according to a survey made by the Machinery & Allied Products Institute, whereas average hourly wage rates have gone up 70% and costs of purchased materials have risen 40-50%.

Foundry Orders Up

Foundry equipment sales rose steadily during the first quarter and it is believed that the upward trend continued in April. New equipment orders as well as repair orders increased far above the volume in the final months of '46. Railroad locomotive builders have full order books. New York Central has bought 75 diesel-electric units from four companies, all of whom are extremely busy. Automobile assemblies are suffering from a painful shortage of materials, but the outlook is bright for handsome production the remainder of this year. Farm equipment and tractor makers report operations at new peacetime levels.

Machine Tool Buyers Cautious

Machine tool sales reflect caution on the part of buyers. Ordinarily automobile manufacturers are the best source of machine tool business, but lately the volume from Detroit has been surprisingly slim. Not until tooling is released for 1949 models later this year will machine tool orders pick up. Other domestic customers have been slowing down their machine tool purchases too. Foreign buyers have been a steadying influence in holding incoming machine tool business at a respectable volume. Orders from abroad have dwindled in recent weeks. It is too early yet to tell what the large loan to France by the International Bank will mean in stimulating industrial equipment orders. France, however, has said that she wants to make heavy purchases of machine tools in this country as soon as credit is available.



Aid to Increased Steel Production—This auxiliary motor-generator set, the longest ever built by Westinghouse, will be installed in one of the nation's big steel mills soon to help roll steel strip at nearly a mile a minute. The power plant consists of a 1500 hp. main driving motor with seven booster generators and three exciters

15 Million Radios to Be Made

Though 4,231,415 radios were made during the first quarter, the industry believes that not over 15 million sets will be produced this year. This will compare with the best previous year when 13 million sets were built. Competition is increasing in radio manufacturing, retail stocks are plentiful and radio makers admit that competitively they already are back on a prewar basis.

Refrigerator production has not yet attained its prewar peak, largely because of materials shortages, particularly steel. Manufacturers think that business will be good all year. However, danger lies ahead in the fact that the industry now has a capacity for making 7 million units a year, whereas in normal times it is hard to sell more than 3 million units.

Electric Range Demand Brisk

Frozen food cabinet sales are disappointing, partly because prices are high and competition stiff. Kitchen cabinet demand, on the other hand, is very good. Electric range business is excellent and should continue brisk, but the outlook for gas ranges is not so cheerful. Office equipment makers are doing a booming trade, here and abroad, with no signs of a letup. In the case of one prominent company, domestic sales and production have been averaging three times prewar.

Steel Output at Record Level

Steel ingot operations were down slightly in April because of a natural gas shortage, but are holding this month near a record level. Finished steel shipments have continued the best since the end of the war. On the basis of output in the first four months, the year's production should reach 63 million tons. March was a record month for sheet and strip tonnage. It appears now that flat-rolled production in 1947 will exceed 18 million tons, which is considerably above the wartime 1941 peak of 16 million tons.

Price Rise on Industrial Equipment Cited as Moderate in MAPI Report

WASHINGTON — Prices of industrial equipment increased only 28% from 1939 to March, 1947, while wholesale prices of commodities rose 94%, raw materials 133%, and manufactured products 79%, and construction costs 102%.

These conclusions are reached in a report by Machinery and Allied Products Institute at Washington, which calls the moderate equipment rise ". . . a truly remarkable achievement."

MAPI, pointing out that wage rates in manufacturing average today 75% higher than in 1939, emphasizes the advantages of mechanization, with the cost of equipment trailing far under prices in the four categories mentioned.

Equipment Items Listed

Index of industrial equipment prices is a simple average of indices for machine tools, construction equipment, engines, air compressors, power driven pumps, various instruments, fans and blowers, powered stokers, industrial oil burners, heat exchangers and oil and water coolers, industrial scales, industrial heat treating furnaces, and equipment for materials handling, mechanical power transmission, gas welding and cutting, and lubricating. Statistics on each of these groups were compiled and presented by the Bureau of Labor Statistics.

Up to now, MAPI says, equipment producers have absorbed an increase of 70% in hourly wages, and a 40-50% increase in cost of materials. Their accomplishment reflects the economies of volume production and of improved mechanical facilities of the industry.

Moderate Profits Cited

Equipment producers have been moderate in profits as well as in prices, says MAPI, quoting figures from National City Bank, showing that 97 machinery manufacturers reported an aggregate profit of 5.9% in 1946 compared with 11.2% in 1936, 9.1% in 1937, 9.8% in 1940, and 8.8% in 1941.

Steel Prices Held Equitable On Basis of Increased Costs

PITTSBURGH—A steady production run at close to maximum capacity in the steel industry appeared to be certain during the balance of the second quarter. Less certain was the prospect of unchanged prices in view of cost considerations.

Steel leaders reiterated that steel prices are fair on the basis of costs of materials entering into production plus the new wage levels established and there was apparent determination to hold to current quotations pending the experience in respect to profits covering either the second or third quarters, or both. The wage increase was retroactive to April 1 and this higher cost, accordingly, will cover the full second quarter of this year.

Minor Changes Possible

On the fringes of the steel industry, however, there were a few signs that the steel price structure could change in minor respects but there was a strong belief that the major companies were going to retain it to June 30. One midwestern producer, a smaller unit in the industry, changed from a price structure which provided for figures at time of shipment to one where quotations at time of order would rule. Elimination of this escalator clause was one of the signs. Of lesser importance are those where producers cut premium prices to become more in line with the industry level.

Separate Agreement Unlikely

June 30 is one important date ahead, also, in respect to costs. If an agreement with the United Mine Workers is concluded by then, there will be no strike but there can be virtual assurance of a higher pay schedule for the miners. Most interest hinges on an agreement.

The steel industry would like to conclude a separate deal with the United Mine Workers in view of the current stalemate in respect to negotiations for an industry-wide agreement. The UMW always has declined to entertain a separate agreement with "captive" mines in the past, and not too much hope is held out for one this year.

Steel company stocking of coal, meanwhile, has been moderate and stocks at the end of June—in event of cessation of work—will be small.

1947 MAN-DAYS OF IDLENESS IN SHARP CONTRAST TO 1946

WASHINGTON—Time lost because of strikes during the first quarter of 1947 was less than 1/16th of the time lost during the same period in 1946 when the country suffered major strikes in the electrical, steel and automobile industries.

The Bureau of Labor Statistics released the following first-quarter comparisons:

	No. of Strikes	Man-days Idle
1947 (1)	905	3,300
1946	1,067	56,400
1945	895	1,360
1935-39 (2)	644	3,240

(1) Preliminary.
(2) Average for period.

The Japanese Underground — Recently released pictures, taken shortly after V-J Day, show the American influence on Japanese industry. Here, a Jap workman is shown at a Cincinnati milling machine in an underground aircraft factory at the Nakajima plant

U. S. Army Signal Corps Photo

Threat of Crippling Coal Strike Diminishes As Negotiations Near

NEW YORK—Metal trades management could look to the future this month with most of its 1947 labor fears dissipated.

Prospects of uninterrupted production and labor harmony were bright as May ended. Management thinking generally had turned from the problems of maintaining production to problems of sales and servicing. The change was welcomed.

Labor skies were not entirely clear, but the clouds were not as menacing as a month ago. They were smaller, localized.

Coal Threat Abating

The biggest and angriest lowered over a broad area of southern soft coal fields. However, clouds had disappeared—temporarily at least—from most of the nation's heaviest producing mine fields. They could easily reappear, swept back by the wrath of John L. Lewis in imminent contract talks; likelihood now is that they will not.

For the moment, Lewis is in a conciliatory mood. Operators of mines which produce about 75% of the nation's bituminous stand ready to negotiate with the United Mine Workers chief on a near-industrywide basis. Government is increasing hopeful that it will be able to surrender most seized mines to private ownership without a strike.

Captive Mines Seek Peace

The real break in what appeared to be an impasse in the coal industry came when the steel labor peace was assured last month. Operators of captive mines, particularly, showed immediate interest in settling with Lewis. They did not want their furnaces shut down for lack of fuel, thus increasing the cost of a strike. And they can absorb the additional costs of coal mining into their bigger steel operations.

Similarly, operators of mines with substantial tonnage and high productivity were willing to string along with Lewis' demands, realizing that they still would be in a favorable profit position under any new pact. Their smaller, southern competitors would be the real sufferers from higher production costs.

Thus, the stage was set for a major break in the operators' ranks. And although Lewis was committed by a UMW convention vote to negotiate only on a completely industrywide basis, it was quickly apparent that his union's mandate would not stand in the way of bargaining if Lewis could be convinced most operators were prepared to enter into serious negotiations on terms for a single contract.

Lewis could not afford to hold out on the rather tenuous argument that UMW is willing to enter collective bargaining on the sole basis of all operators, or none.

Nothing to Lose

Moreover, Lewis is fully aware that UMW has nothing to lose by bargaining with the major part of the industry, leaving the southern operators until later. To the contrary, UMW could gain by it. Negotiations would go easier. Northern and western operators, the captive mines group, and a few southern operators who are closely linked with northern operations already have shown themselves to be amenable to Lewis' demands. The union can win more, Lewis believes, by dealing with them directly than with the industry as a whole—including those, for instance, who vow they won't sign any contract which continues the Krug-Lewis welfare fund.

Settlements worked out later with nonconformist southern operators could be shaped by the union to the national coal contract pattern. During the pressure of localized strikes, the strong competition of operating mines would work in Lewis' favor.

Meanwhile, coal reserves are now piling up. Production rates currently are high.

Other Industrial Fronts Calm

Other industrial fronts show relative calm. There are localized clouds of unrest, some stoppages, in such key industries as steel and electrical manufacturing. As in coal, it is a matter of dissatisfaction by smaller operators with the necessity of participating in what has become, in effect, industrywide contract-making.

When U. S. Steel's contract with the CIO was signed last month it applied only to 140,000 of Big Steel's employees, but its terms were quickly the demand of all other workers in basic steel and steel fabricating. The Non-Basic Steel Coordinating Committee was vocal in statements that its members, who employ several times as many workers as U. S. Steel, would not be bound by the 12½¢-plus settlement (aggregating about 15¢ an hour) which it had given. In 1946 this rejection of a pattern settlement led to long and costly strikes in fabricating works. It was quickly evident, however, that there would be no repetition of this situation in 1947.

Two factors were at work: (1) many fabricating companies were hurrying to sign up in the pattern, and (2) other smaller companies, with individual financial problems, were finding Philip Murray's steel union negotiators willing to talk terms ranging upward from 9½¢ an hour more.

The same situation could be found in electrical manufacturing.

Pattern settlements undoubtedly were of prime importance for management. But of equal importance to them was the fact that collective bargaining, on a serious and sincere basis, was showing real successes this year.

Union Merger Meeting—One of the most important meetings in many years was held recently when President Philip Murray of the CIO met with AFL leaders to discuss a possible merger of the two organizations. (L to R) President William Green, AFL; Murray; Daniel Tobin, head of AFL Teamsters Union; and John L. Lewis, President of AFL United Mine Workers

Detroit

'48 CAR MODEL TOOLING PROGRAMS AWAITED...GM REPORTED EXPERIMENTING WITH "V" ENGINES...PRODUCTIVITY ON RISE

New Machines Debated

Automobile company purchasing agents are seeing or hearing comparatively little that is new in their contacts with machine tool makers. Some of them profess to be provoked about it. They indicate belief that new machines are being held up by the makers, in order to dramatize initial showings at the forthcoming machine tool show in Chicago.

Whether this is true or not, it is one of at least two viewpoints on new product development. Another comes from one of the machine tool makers. His firm has been incorporating some worthwhile new ideas into the equipment it sells. This man says he does not believe that the machine tool makers generally have done what they might to develop new products which will obsolete those already in the field.

"It makes it hard for companies like our own, which have turned out new things," he observed. "We all have to move along in step. When only one of us moves, we can't get very far if other machines haven't changed on lines we fit it to."

Impact of Surplus Machines

There is comparatively little new business at hand for the machine tool makers. Those in the Detroit area find their problems intensified by the appearance of huge War Assets Administration lists of surplus machines. In addition, of course, the absence of concerted and substantial 1948 model tooling programs by the auto industry is a depressing factor.

In the midst of the relative calm which has settled down over an auto industry whose 1947 model labor troubles seem behind it, the only really intriguing whispers are those concerning Ford. This is not surprising; Ford always produces the best gossip tidbits.

Ford Practices May Change

The current tales are that the flow of outside engineering talent into the Rouge is turning sharp looks toward many Ford practices which have been unshakably standard in the past. The transfusion of non-Ford thinking may produce some changes in the orthodox practices.

One item under study, go these shadowy reports, is the engine crankshaft. Ford alone in the industry has cast its shaft; the others have forged theirs. A switch away from the cast crank would be in the nature of a minor revolution.

Another, believe it or not, is the V-8 engine itself. The influx of General Motors engineers brings with them, logically enough, a feeling that in-line powerplants have attributes which the V-8 cannot meet. Whether this viewpoint, in common with the divergent thinking on crankshafts, will come to any head for the 1948 models, or any models, remains to be seen. But it is evident that the study of product development at River Rouge is digging right down to fundamentals.

Experiments With "V" Engines

On the score of engines, it might be noted that while there is conversation about turning from the V-8 engine at Ford, there are also well-grounded reports at large that some of the General Motors divisions themselves are experimenting with "V" units for themselves. It would be a supreme irony if each of these companies switched over to the other's specialty.

At the Lincoln division of Ford, the assembly line is being extended from one of the shortest to one of the longest in the company. Production departments are also being improved. New machinery is going into the con rod and block test departments; renovations are immediately ahead for the camshaft and crankshaft departments; the new motor assembly line is nearly done; and a large amount of new materials handling and conveying equipment has been installed throughout the plant.

Record Assemblies Seen

At Packard, the new final assembly line is now completely operating, and a second line is ready to go whenever flows of materials and parts permit. When this second line moves into action, sometime toward the end of this year, output will be at a rate of 200,000 assemblies a year—by far the best Packard has yet been able to turn out.

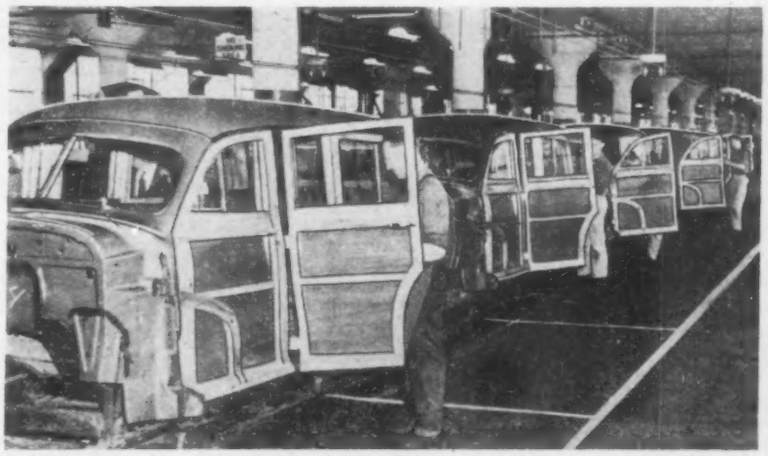
A remark by Packard's president, George T. Christopher, that productivity has advanced 10% since fall, brings to mind the fact that less complaint is being heard all the time on efficiency.

Efficiency Rate Improves

Certain large plants won't say so for publication, but their executives state that in a few departments and shops the efficiency rate today, so far as it can be figured, is upwards of 100% of normal.

Keeping an eye on Buick may not be a bad tactic. The Flint-based branch of General Motors has an eye fixed on third volume place, held in recent years by Plymouth, and is moving to try to capture it. The race will be a hard one, for Plymouth has produced as high as 550,000 cars in prewar years, against Buick's peak of 375,000, but the latter company is tooling for really intensive operations.

Capacity will be raised 40% over the 1941 level by expansion programs now in final stages. Seventeen new buildings will add 2,325,000 feet of floor space, about a third of this in stamping capacity alone.



Fisher Body Station Wagon—Following a recent announcement by Fisher that it planned to embark on the production of station wagon bodies exclusively for Chevrolet, the company is currently averaging about a dozen units daily while assembly line kinks are being ironed out. Two body styles are being made—one with two seats and one with three—for shipment to Chevrolet plants throughout the country for chassis assembly

Machine Tools Valued in Millions 'Discovered' in Cleveland WAA Sheds

CLEVELAND—Machine tools, both standard and special types, valued at between $60 and $80 million have been standing in sheds of the 14 WAA warehouses in this area for the past several months without the sales department of the federal agency being aware of their presence and certainly without the knowledge of potential buyers.

Col. James H. Frier, Jr., acting WAA regional chief, uncovered this pool of machine tools in mid-April when he ordered an inventory of all WAA surplus property in the area.

Many Storage Sites Empty

In a subsequent survey, Col. Frier found that 500 places, mainly industrial plants, listed as storage sites for WAA property, have nothing in them—that another 800 storage sites located throughout this district have material in them but WAA records are so faulty, the office cannot determine what they contain until a full count is made. Col. Frier believes, however, that only a small part of the $167 million inventory charged against his office are in these sites.

The big cache of WAA equipment is the $50 million in the Cleveland Quigley Road site. Efforts are being made to correct records. The next biggest dump of WAA material is at a Toledo warehouse where improper records have precluded $13 million worth of equipment being placed on sale.

Records Apparently Lost

Machines were inventoried into warehouses, but they had not been processed further, or if they were, records became lost between warehouse and sales department. While few doubt that all of the "lost" machines are still in storage sheds, it is admitted that the opportunity was present for removal of one or a dozen without detection.

The situation is attributed to change in procedure, incompetent help, overweight of paper work, and the apparent anxiety of some manufacturers to rid their plants of government-owned tools at the end of the war.

Wartime users dumped many machines at the WAA warehouse with promises to supply needed information. They failed to follow through, precluding the sale of many surplus tools because of incomplete records.

Other Agencies Tag Tools

The process of properly cataloging, rating and pricing these machine tools is still going on. Meanwhile officials of other government agencies are going through the Cleveland area WAA warehouses with increasing activity, tagging machine tools for storage in the interest of national security.

April sales of surplus material in Cleveland area jumped over the $18 million mark, substantially ahead of the $9 million figure for March. Col. Frier was unable to say how much represented machine tools, but said such items had fallen off considerably in sales within recent weeks. He did not favor holding machines for several weeks for the benefit of privileged bidders.

Warehousing Costs High

Paper work in preparing each machine tool for sale costs over $20. Removal of machines to WAA warehouses averages about $500. Monthly warehousing cost in the Cleveland area is estimated at $287,000. Col. Frier hopes to reduce this to $100,000 by July 1, when he will have closed all WAA sites except 13 actual warehouses, eight government-owned, and five privately owned.

Col. Frier maintains he has found no evidence of dishonesty or deliberate falsification of records, but has turned up neglect in checking physical inventories with mountain-high paper record.

Labor Market Softens in Chicago But Business Activity Continues

CHICAGO — Reports on business conditions in the Chicago area, as they affect metalworking firms, present a conflicting picture. For the first time in more than a year a softening has appeared in the labor market; but Chicago industries have added 5,000 men to their payrolls in the last two months.

The latest report of the Chicago Association of Commerce and Industry showed a very slight decline in both the employee and payroll indexes of manufacturing industries from the month before, although both measures are still far ahead of the comparable 1946 month. The report said, however, that the general upward trend in business activity was continuing.

The state labor department surveyed a sample group of 2,483 manufacturers throughout Illinois, employing 649,133 production workers or two-thirds of all those in the state. For the latest month this group showed a decrease of one-half of 1% in employment and slightly more in payrolls. Non-manufacturing employment and payrolls, on the other hand, increased in the month.

In Chicago the decreases in employment were most marked in the machinery and machine tool groups.

Opposed to this report is one released by the Illinois State Employment Service. A survey of 1,135 large manufacturing firms showed that they employed 5,000 more workers in the Chicago area than they had two months earlier.

The employment service report said that Chicago manufacturers will require an additional 32,000 workers before July.

ANMB Continues Stockpiling Work Pending Military Merger Action

WASHINGTON—Pending final Congressional action on President Truman's military merger legislation, which will decide the fate of the Army and Navy Munitions Board's functions, the board is going ahead with its job of stockpiling and writing the basic plan for industrial mobilization.

Richard R. Deupree, chairman of the ANMB, has reemphasized the board's determination to build an adequate stockpile of strategic and critical materials. He explains that while the board has not spent all of the $100 million appropriated by Congress for this year's stockpiling program, due to high prices and civilian shortages, transfer of surplus materials from government agencies has brought the year's procurement close to the theoretical goal of $360 million.

Budget for 5-Year Program

The board's five-year stockpiling program calls for an expenditure of $1,800 million, in increments of $360 million a year. The board will ask Congress shortly for $360 million for stockpiling next year, which, when added to funds left over from this year's appropriation, will make approximately $400 million available for military procurement of materials.

"Prices are already dropping and shortages are starting to disappear and it now looks like we will be able to do more buying next year," Deupree said.

Opposition to Plan Seen

In the event the President's merger plan is passed without change, the ANMB would be relegated to a back seat on the problem of organizing industry for another emergency. A civilian board, similar to the WPB, would be established to carry on the job now under the ANMB's wing. The board would lose its stockpiling job, and would have only the military needs to coordinate.

Developments in Plastic Equipment Exhibited at National Exposition

CHICAGO—More than 140 American and Canadian firms exhibited postwar advances in plastic materials, molding machines and processing methods, and in new applications of plastic materials to industrial and consumer products at the National Plastics Exposition held here May 6-10. Sponsored by The Society of the Plastics Industry, the exposition attracted a record attendance estimated at more than 30,000 manufacturers, molders, fabricators and others identified with the plastics industry. Included were industrialists from Canada, Latin America and Europe.

Of special interest were a number of new injection and transfer molding machines on display for the first time. Giddings & Lewis Machine Tool Company's new Plastic Division exhibited a No. TP-20 10-oz. capacity vertical injection molder claimed to facilitate insert molding because molds are horizontal instead of vertical. Design permits free access to all units to reduce maintenance time. Complex mechanisms are avoided by using multiple hydraulic cylinders.

Injection Molder Exhibited

Fellows Gear Shaper Company, also a newcomer to the plastics industry, showed a new Fellows-Leominster Model 1B-2 horizontal injection molder of 2-oz. capacity. It can make 7½ cycles per min., plasticizing 30 lb. of material per hr. A new 4-oz. capacity injection molder having a novel electrically heated plasticizing chamber was displayed by Crown Machine & Tool Company of Fort Worth, Texas. Hydraulically operated and electronically controlled, this machine operates automatically on cycles as short as 20 sec. As much as 45-lb. of material can be plasticized each hour. The Van Darn Iron Works Co. announced a new Model H-300 horizontal injection molder of 3-oz. capacity. It features two-zone heat control and automatic operation.

A new machine for preheating, preforming and molding in one fully automatic operation was displayed by Rockford Machine Tool Co. Of 8-oz. capacity, this hydraulic machine has a built-in electronic dielectric heating chamber timed and interlocked with the molding cycle. Plastic material feeds by gravity into a measuring chamber. Forward travel of piston in this chamber blocks off feed from hopper and carrier material to throat of preform cylinder where it is compressed to correct density. From this cylinder, preform drops into heating chamber to be held under precise heat control until ready for delivery to molding cylinder. From here charging ram forces preform into cavities of die for polymerizing. All steps in the cycle are interlocked for continuous operation of the machine.

Retiring president, Neil O. Broderson (l), who is now chairman of the SPI board, and George H. Clark (r), newly elected president of the society and vice president, Formica Insulation Co.

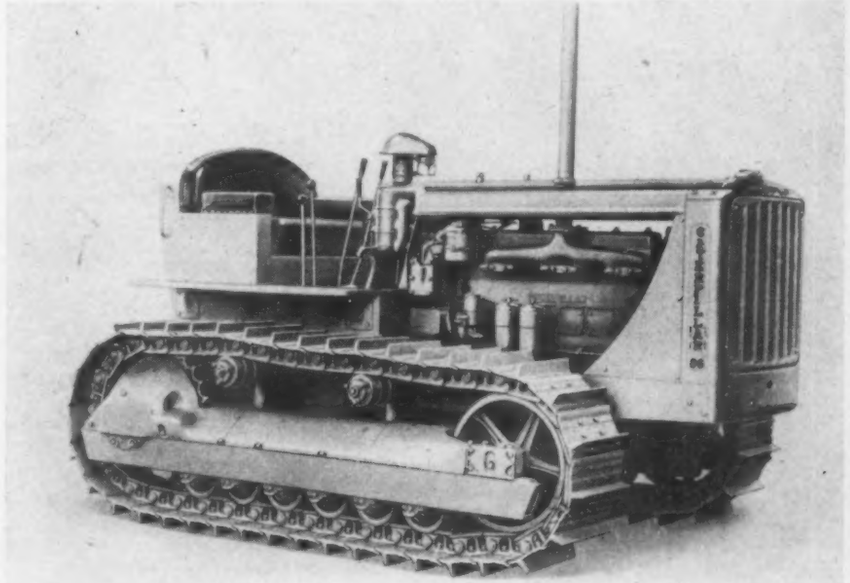
Automatic Cycle Presses

Lake Erie Engineering Corp. and Elmes Engineering Works both showed new hydraulic transfer molding presses. The 200-ton Lake Erie compression and plunger molding press has a 50-ton inner ram mounted inside the main ram to move in the same direction. The design permits rapid molding and convenient handling where parts can be arranged around the central cavity and gated through the split in the mold. Cycle is automatic once the start button has been pushed. The new Elmes transfer presses are made in 75- to 300-ton capacities.

Kux Machine Co. showed a Model 67 preform press for high bulk factor materials with poor feeding characteristics. Press has conveyor feed and positioning feed turret. A new auxiliary electric steam generator for producing process steam up to 500 psi. working pressure was shown by Speedylectric Engineering Co. It is applicable to heating molds and laminating dies, and to other industrial operations.

Clark Elected President

At the tenth annual convention of The Society of the Plastics Industry, held concurrently with the exposition, more than 1,000 members heard technical papers on molding processes, new materials and equipment, and on management problems such as sales and cost accounting. George H. Clark, vice president of Formica Insulation Co., was elected president of the society. He succeeds Neil O. Broderson, president of Rochester Button Co., who becomes chairman of the society's board of directors. Other new officers include: vice president — Gordon Brown, vice president of Bakelite Corp; secretary —Norman Anderson, president, General Molded Products, Inc.; treasurer —Warren Hill, vice president, Prophy-lac-tic Brush Co. William T. Cruse continues as executive vice president of the society.



Agricultural Machinery Production—After prolonged strikes in the industry, agricultural machinery manufacturers are stepping up production to meet the pent-up demand. New models are typified by this new Caterpillar diesel tractor which offers 10 more hp. at drawbar and belt than the previous D6

Foreign Report

(BASED UPON REPORTS FROM McGRAW-HILL WORLD NEWS BUREAU)

India's Metalworking Industries Spurred By British Enterprise

HYDERABAD-DECCAN, INDIA—A booming metalworking industry is in the making at this city, capital of India's largest princely state, but dollar restrictions plus British enterprise are giving the development a distinctly British tinge.

▸ Allwyn Metal Works, Ltd., soon will complete construction of new factory space which will give the factory 400,000 sq. ft. of covered workshop. Specializing formerly in metal furniture for office and institutional use, Allwyn now has branched out into two other fields—buses and refrigerators.

▸ It is assembling 150 new buses for the State Railway's Road Transport Division, using British Albion "Vertue" chassis for single-deckers and Albion "Venturers" for double-deckers, and assembling bodies from panels shipped out by the British Park Royal bus body works. An agreement was reached recently whereby Allwyn will begin stamping and manufacturing the bodies under a license agreement with Park Royal.

Refrigerator Production

In the refrigerator line, Allwyn has signed agreements with the Pressed Steel Products, Ltd., Great Britain, and expects to be producing 20,000 refrigerators annually by the end of 1948. Employing 1300 at present, the company expects to employ 4000 when plant expansion is complete.

▸ Financial interests behind Allwyn have purchased from the British Government the 400-acre war-built Bren gun factory. Two companies have been organized to operate side by side in this plant—one a 2000-a-month asbestos products works and the other a 50-ton per day sheet glass works. Both are capitalized at nearly $1 million.

▸ Bigger than either of these, however, will be a deal now under negotiation by which it is hoped the Birmingham Small Arms, Ltd., Britain's famous "BSA" will come to Hyderabad under some kind of a joint stock arrangement, perhaps supplying patents and "know-how" in return for a share in the profits.

State Holds 50% Interest

All of these deals enjoy a semi-official status, for the State has a 50% share interest in the asbestos and glass plants (as well as a 15% interest in the Allwyn Metal Works itself) and presumably will participate in the BSA plan when and if it is finalized and put in operation.

▸ Another firm taking a position of national importance is Praga Tools, Ltd., already capitalized at nearly $1,500,000, and soon to be enlarged by double that amount. Praga is India's only manufacturer of high-precision gages and small tools. Equipped with some 35 precision machine tools purchased from the Bren gun factory, it is under direction of a cadre of Czech tool experts who originally came to India to work at the Bren plant.

U. S. Manufacturers Preferred

U. S. equipment predominates at Praga, and additional heavy purchases are scheduled in America for management has found that U. S. manufacturers can supply within six months at price 50% less than British, firms which are quoting delivery dates running into 1949.

▸ At present steel is one handicap all these concerns have to face, but India recently eased this somewhat by lifting all restrictions on the importation of steel. Now the only problem of affected industries is to get delivery from the U. S.

Steel Industry Planned

Even this aspect has a long-term solution in view. Hyderabad State has a 20-year development program, centering in the Godaveri Basin about 150 miles north of this city, which among other things calls for the establishment of a state-owned iron and steel industry. Agreements have been reached with a neighboring state for deliveries of its high-grade iron ore and patent rights obtained for the processing of Hyderabad's extensive steam coal deposits for use in steel-making. A British engineering firm now is conducting studies of the program with a view to construction of a plant capable of producing 500,000 tons of ingot annually.

▸ Meanwhile, Hyderabad financiers —many of them multi-millionaires by any country's standards—are studying other plans for large-scale heavy industries and agree that American methods, patents, techniques and assistance can play a large role in their projects.

Bus Production in India—Shown here is one of the buses assembled by the Allwyn Metal Works, Ltd., Hyderabad-Deccan, on a British Albion "Venturer" chassis with knocked-down bodies supplied by Park Royal Ltd., England. Contracts have been signed for the production of these bodies at Allwyn's plant

Britain Modernizes Steel Industry

LONDON—Modernization and development of the iron and steel industry are progressing under plans calling for expenditure of $672 million of which $60 million would be spent on equipment from the United States. Conversion to oil burning in the industry has been greatly stimulated. Meanwhile plans are advancing for modernizing the South Wales tin-plate and sheet-steel industry, scheduled to cost $200 million.

Washington

END OF SURPLUS PRIORITIES SOUGHT . . . ARMY-NAVY SEEK STRONG LEASE CONTROLS . . . REPORT ON LEND-LEASE GOODS

CPA Functions Replaced

Commerce Dept's new Office of Materials Distribution early this month took over limited control of a half-dozen critically scarce commodities, and of priorities on exports needed to expand foreign production of goods needed by this country—formerly functions of the defunct Civilian Production Administration.

OMD under direction of Horace B. McCoy, Office of Domestic Commerce chief, later will be liquidated or parceled to other Commerce sections.

Surplus and Buyers' Market

Nearly half of War Assets' surplus stock still unsold will go ever slower with more bid sales, as buyers' market comes in. Disposal will near a standstill if a recession comes. In which case Congress might freeze it or give it away to those who would be in the market anyway.

Wants Priorities Dumped

WAA has ordered that all machine tools in inventory after being offered to commerce and priority holders at fixed prices, are available for donation to federal and local governments and to non-profit institutions. On total disposal to date of $16 billion, recovery is $3,353,000,000 or 35.9%—before deduction of $612 million for expenses. Realization on foreign surplus by Foreign Liquidation Commission is 23%.

Administrator Littlejohn has asked Congress to wipe out priorities, including those to veterans, and excepting the government itself and present owners and tenants of real property. WAA now requires deposits on fixed price sales as well as on bid sales. Three branches that handled priority sales have been consolidated.

Procurement Bidding Returns

Army's announcement it will resume advertising for procurement bids means simply that common items will be bought under competitive conditions which did not exist in wartime, but which are now returning.

Army told AMERICAN MACHINIST the move has no relation to pending legislation which when passed will authorize Army and Navy to continue negotiation of contracts for special items as they did under war laws. It is expected the bill will be passed before the war powers expire. Under Army's resumed bid program, sealed bids will be accepted from all qualified parties, regardless of geographic location.

Controls on Leased Plants

Army and Navy asked Congress for authority to lease 77 plants to private operators with guarantee that the plants would be kept in good working condition, and be subject to immediate repossession in emergency.

Involved are 43 Army plants and 34 Navy plants. Most are ordnance plants, but 13 Army plants are chemical, one experimental fuel operation. Some of the units are owned by RFC, a few have been declared surplus to War Assets, and some are owned by Army or Navy, in standby. The joint bill would require RFC and WAA to transfer title of wanted plants to Army or Navy within six months.

RFC and WAA have written repossession and condition clauses into all of their lease contracts, but armed forces have no such authority at this time. Obviously Army and Navy desire stricter control over the 77 units than is provided in existing clauses. This is one of several recent Washington moves toward ready military power.

Report on Lend-Lease

In his report on activities of the Foreign Liquidation Commission, which is under the State Department, Secretary George C. Marshall says about $1 billion worth of lend-lease property will be returned to U. S. by foreign governments.

State officials revealed to AMERICAN MACHINIST that full title of lend-lease has been transferred to some governments, including some weapons. The U. S. in the future will not press for recapture of most lend-lease stuff because it is not worth shipping home. Some has been traded for considerations.

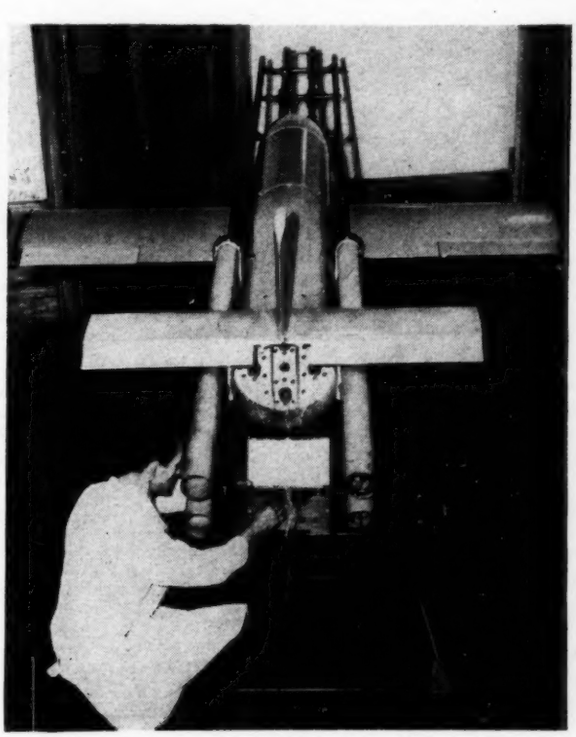
Included in Soviet lend-lease, on which negotiations for settlement have been started at last, are $120 million worth of machine tools.

Pump Industry Drafts Rules

Trade practice rules for the vertical turbine pump industry have been drafted, following an initial meeting at Chicago, and written comment is being received by the Federal Trade Commission until May 28, with oral testimony scheduled for that date.

The Commission informed this magazine that it has no record of proceedings against industry members, and does not know what malpractices may have prompted the move for rules. Volume of the vertical pump industry's business—at manufacturers' prices—is estimated at $25 million.

FTC is conducting an informal campaign for adherence with fair trade rules in general. FTC's approved rules are enforceable in court.



Radio Controlled Rocket — Under secret development for the past year and a half this first British pilotless radio controlled rocket missile was designed and developed by the Research Div. of Fairey Aviation Co. It is shown here on exhibition in London after the successful completion of full range flight trials. Rocket is of orthodox monoplane design with cylindrical fuselage 7 ft. 5½ in. long and 12½ in. in dia. Span of the mainplane is 6 ft. 10 in., and of the tailplane, 4 ft. Maximum speed is over 500 mph. and it attains 267 mph. 2 sec. after firing

Coal and Oil-burning Gas Turbines Challenge Diesel in Railroad Field

WASHINGTON — With economy in operation the by-word, railroad locomotives are receiving considerable attention. Diesel locomotives came along to give steam types a real threat. Now diesels are being challenged by coal powder-burning gas turbines and oil-burning gas turbines.

Railroaders are chiefly interested in the engine that will deliver the most pull at the draw bar per dollar of fuel.

Electric locomotives, the engineer's dream, are trailing the contest. Cost of electrification is supportable only on heavy traffic routes. The electric is not a prime mover; it is merely the remote output of a power plant.

Diesels Hold Big Lead

Of 640 locomotives on order for domestic use as of April 1, six were electric, 52 were steam, and 582 were diesel. Each of the diesels may be one unit or several units articulated as a train-pulling unit, so the diesel total is much larger than 582.

Here is a summary of what some leading locomotive manufacturers are doing:

▸ *1. American Locomotive Co.* — Building reciprocating steam locomotives; diesel locomotives, both road and switcher types; electric locomotives; working on development of one of the Locomotive Development Committee's two coal powder-burning gas turbine locomotives; heat transfer, oil well, and other equipment.

▸ *2. Baldwin Locomotive Works* — Diesel locomotives, road and switcher types; reciprocating steam locomotives, road and switcher types; electric locomotives; built one geared steam turbine locomotive for Pennsylvania Railroad, now in service; building three electric-drive steam turbine locomotives, with Westinghouse electric equipment, for Chesapeake & Ohio Railway.

▸ *3. Electro-Motive Division, General Motors*—Diesel electric locomotives, road and switcher types; interested but not yet active in development of gas turbine locomotives.

▸ *4. Fairbanks, Morse & Co.* — Hooded-type diesels, road and switchers, using Westinghouse electric equipment; cab-type road diesels built for Fairbanks, Morse at Erie works of GE, which makes the mechanical and electrical equipment, Fairbanks, Morse furnishing the engines.

▸ *5. General Electric Co.* — Electric locomotives; diesel electrics, road and switchers; motors and generators for all American Locomotive electrics; building oil-burning gas turbine locomotive for experimental freight service; supplying traction motors to Allis-Chalmers—American Locomotive coal powder-buring gas turbine locomotive for Locomotive Development Committee.

▸ *6. Lima Locomotive Works*—Reciprocating steam locomotives, road and switchers; reported about to begin work on a coal powder-burning gas turbine locomotive for Chesapeake and Ohio, with Westinghouse electric equipment, in cooperation with Locomotive Development Committee.

▸ *7. H. K. Porter Co.*—Reciprocating steam locomotives, road and switchers; diesel locomotives, road and switchers; Quimby pumps, industrial and railroad springs.

▸ *8. Westinghouse Electric Corp.* — Electric equipment for Baldwin diesels; electric equipment for Fairbanks, Morse diesels; built turbine and gearing for Baldwin geared turbine locomotive for Pennsylvania Railroad; building 2000 hp. oil-burning gas turbine locomotive for test.

▸ *9. Whitcomb Locomotive Co., subsidiary of Baldwin*—Smaller diesel electrics.

Demand for Steel Remains High Despite Some Buying Opposition

PITTSBURGH — The steel demand situation has tended to come into the limelight recently notwithstanding that all reports confirm large backlogs and insistent requests for shipments. Industry executives have said publicly they do not anticipate a balance between supply and demand in steel prior to the fourth quarter of 1947, but doubters point out the growing buyers' strike in respect to construction.

The impression given from this latter trend is that a drop in shipments of structural steel is inevitable and light flat-rolled finishing mills are so choked that they will be unable to take any more semi-finished, of which there may arise a surplus in event the so-called "heavy products" come into lighter demand.

Demand for Freight Steel

This appears to industry observers to be inconceivable with the railroad equipment industry panting outside the doors of the steel industry for larger quotas of shapes and plates to make more freight cars. The steel industry is unable to promise sufficient steel to make the promised 10,000 freight cars per month and repair others before July and there are some hints that the full allotment of steel may not develop even then.

Shape demand is rather spotty but fabricators are unable to get enough steel for their needs. There is a tendency toward elimination of escalator clauses in structural contracts. The number of cancellations involves a relatively small tonnage. Plate backlogs are heavy, and spring largely from tank, barge and similar projects in addition to railroad needs. Public works programs support a really large demand in reinforcing bars, other small bars are in consistent demand and only large bars have a short backlog.

Response of West Coast Firms To Ford Appeal Termed 'Fizzle'

SAN FRANCISCO — Observers interested in metalworking shop activities in the bay area are watching carefully the results of two recent events, both of which were reported at the time in AMERICAN MACHINIST. They are Henry Ford II's announcement last February that he wanted to add about 2,600 parts to those already manufactured in the west for assembly here and the Western Metals Congress held in Oakland in March.

According to Ford spokesmen, their exihibits and appeals to local shops for price figures were somewhat of a fizzle. To date no contracts have been let and indications are that only about 25% of the bids submitted were at prices equal to or less than eastern prices plus freight.

However, Ford apparently was dead serious when he started this drive, for now meetings have been arranged, in neighboring country where open capacities are known to exist. L. C. Disser, out here from Detroit, and O. Stahmer, purchasing agent for the Richmond assembly plant, will attend these meetings to work out problems presented by shop operators, even down to the expediting of raw materials.

The reason why so few bids were received that would fit Ford's requirements is believed to be that small shops here, accustomed to small special orders, were somewhat at a loss when asked to bid mass-production jobs.

Since the Ford announcement other automobile manufacturers with assembly plants on the coast have expressed a desire to boost their western purchases. It is estimated that at least $200 million will be spent by these firms, including General Motors, Willys, Chrysler, Kaiser-Fraser and others.

Names in the News

Swan Bergstrom

Swan E. Bergstrom, vice president and sales manager of the Cincinnati Milling Machine Co.; **Nelson F. Caldwell,** vice president and export manager of the firm's mill; and **Carl F. Roby,** vice president and assistant to the general manager, have been elected to the board of directors of the Cincinnati machine tool firm. Mr. Bergstrom is currently chairman of the National Machine Tool Builders Association Machine Tool Show which will be held in Chicago next September.

Carl Roby

Nelson Caldwell

Isaac Harter, who has retired as vice president and director of The Babcock & Wilcox Co., has been elected chairman of the board of The Babcock & Wilcox Tube Co. With Mr. Harter's election, **P. D. White** became executive vice president of the company. Also, **Anthony M. Kohler,** general manager of the refractories division, and **Alan E. Phin,** controller, were elected vice presidents of Babcock & Wilcox Co.

Jacob S. Disston, Jr., vice president for 14 years, has been elected president of Henry Disston & Sons, Inc., Philadelphia. He succeeds **S. Horace Disston,** who has been advanced to chairman of the board.

M. W. Reed, chief engineer of Carnegie-Illinois Steel Corp. since 1939, has been elected vice president in charge of engineering.

John M. Washburn has been elected president of the Merrow Machine Co., Hartford, Conn., succeeding the late **Joseph M. Merrow.** Mr. Washburn joined the company in 1919 and was elected treasurer in 1930.

J. Herbert Myers, secretary and a director of Lodge & Shipley Co., Cincinnati, has been elected vice president in charge of machine tool division sales.

Robert P. Tyler, formerly general sales manager, has been elected vice president in charge of sales for the Macwhyte Co., Kenosha, Wis.

W. J. Creighton has retired as executive vice president of Jones & Laughlin Steel Corp., Pittsburgh. New members of the executive committee include: **Frank R. Denton, C. L. Austin** and **H. Parker Sharp.** The latter two were named vice presidents at the same time, along with **V. H. Lawrence, W. H. Dupka,** and **H. W. Graham.**

Daniel S. Dinsmoor, vice president of Monsanto Chemical Co. and general manager of the company's Merrimac Div., has resigned to enter the chemical consulting profession.

E. D. Cowlin has been named general manager of the Reliance Div., the Eaton Manufacturing Co., Massillon, Ohio.

Justus W. Lehr has been appointed general manager of the ACF Berwick, Pa., plant of American Car & Foundry Co., succeeding **Guy C. Beishline,** who recently resigned.

Ivan L. Nixon and **Ben A. Ramaker** have been elected vice presidents of the Baush & Lomb Optical Co., Rochester, N. Y.

L. C. Grimshaw has been appointed metallurgical engineer of the Clad Products Div., Jessop Steel Co., Washington, Pa.

Rudolph E. Reimer, secretary and treasurer of Dresser Industries, Inc., Cleveland, has also been elected a vice president of the company.

J. Lester Perry has been elected president of the Columbia Steel Co., San Francisco, succeeding the late **William A. Ross.**

Rossiter R. Holt has been named general sales manager of Silliter-Holden, Inc., Hartford, Conn.

Douglas M. Lyon has been appointed sales manager of the Porter-Cable Machine Co., Syracuse, N. Y. **Harvey L. Ramsay,** former sales manager, is now vice president in charge of merchandising.

M. L. Gearing

D. M. Hallier

Milton L. Gearing has become general manager of New Departure, Div. of General Motors Corp., succeeding **F. G. Hughes,** retired.

David M. Hallier, sales manager, has been named vice president of the National Tool Co., Cleveland.

William R. Breetz has been named vice president and treasurer of the Bridgeport Brass Co., Bridgeport, Conn. At the same time, **Michael Schwarz** was named vice president in charge of procurement, and **Robert N. Allen** was named vice president for Indianapolis.

Alexander Gabay has resigned as president and general manager of the Helwig Manufacturing Co., Inc., St. Paul, Minn.

George P. F. Smith, president of Marbon Corp., has been elected a vice president of Borg-Warner Corp., Chicago.

Stuart Sinclair

Glynn Williams

Stuart E. Sinclair has been appointed chief metallurgist of The Greenfield Tap & Die Corp., Greenfield, Mass. For over 10 years he has been a metallurgist with the Geometric Tool Co.

Glynn Williams has been named chief engineer of the Axelson Manufacturing Co., Los Angeles. He succeeds **E. W. Ostrom,** who recently resigned. Mr. Williams has been with Axelson since 1934, recently in charge of aircraft engineering.

Howard M. Dirks has been elected vice president of Carrier Corp., Syracuse, N. Y.

W. E. Bahl, factory manager, has been named vice president in charge of manufacturing at the National Cash Register Co.

Arthur E. Kallinich, sales manager, and **David J. Post,** assistant to the president, have been elected vice presidents of Veeder-Root, Inc., Hartford, Conn.

Elbert L. Potter has rejoined the Houde Engineering Div., Houdaille-Hershey Corp., Buffalo, N. Y., as divisional sales manager.

OBITUARIES

W. C. Trout, 75, president of the Lufkin Foundry & Machine Co., Lufkin, Texas, died April 24.

Clarence N. Frey; 73, president and owner of the J. M. Robinson Manufacturing Co. for 30 years and, more recently, training supervisor of training for the Allis-Chalmers Cincinnati plants, died April 25.

Earle G. Leonard, manager of the machine tool division of the Buffalo Forge Co., Buffalo, passed away Mry 3. He had been with the firm since 1909.

Edward S. Montanus, 62, former president of the Springfield Machine Tool Co., Springfield, Ohio, passed away April 28. He also had served as president of the Brake Equipment Co. some years ago.

BUSINESS ITEMS

Eaton Manufacturing Co., Cleveland, has formed three new Michigan divisions to replace the former **Wilcox-Rich Div. The Valve Div.,** Battle Creek and Lawton, manufactures automotive, aircraft and diesel engine valves; **The Pump Div.,** Marshall, produces rotor pumps; and **The Saginaw Div.** produces hydraulic valve lifters, tappers, valve seat inserts and fan drives. Managers of the three divisions are: **H. I. Dyer,** Saginaw; **Herbert Russell,** Valve; and **F. H. Mott, Jr.,** Pump.

The Falk Corp. has recently opened a Philadelphia sales office at 505 Race St. **Dave S. Ferree** has been appointed district manager of the office, which covers Del. and Pa. areas.

Borg-Warner International Corp. will handle the export activities of **Service Spring Co.,** Indianapolis.

Siewek Tool Co., Detroit, has appointed **H. Colby Rowell Co.,** 2447 Nickellet St., Minneapolis, as Minn. distributor of Siewek rapid clamping drill jigs, and fixture clamps.

The Bunnell Machine & Tool Co., Cleveland, has completed a departmental program of expanded technical and machine facilities for the designing and building of special machines, tooling and dies. The company has also appointed the following district representatives: **State Machine Tool Co.,** 1441 No. Third St., Milwaukee, Wis.; **Herbert K. Baker,** 3020 E. Grand Blvd., Detroit; and the **Triplex Machine Tool Corp.,** 125 Barclay St., New York City.

The Combustion Equipment Div., of **Todd Shipyards Corp.,** has moved its entire facilities from New York City to a modern plant and office building at 81-16 45th Ave., Elmhurst, L. I., N. Y.

Edward B. Capron, New York sales manager of **Taft-Peirce Mfg. Co.,** Woonsocket, R. I., and **Donald T. Shaw** are resigning from Taft-Peirce to start on June 1 as partners and manufacturers agents, with headquarters in Woonsocket. Specializing in perishable cutting tools, they currently have exclusive agency arrangements with **Connecticut Broach & Machine Co.,** New London, and **Cowles Tool Co.,** Cleveland. For the latter firm their territory includes northern N. J., metropolitan N. Y. and New England.

The Clarence Machine Co., Inc., 2551 W. Dodier Ave., St. Louis, Mo., has been incorporated as a machine shop by **Edward, Charlotte** and **Louis Gund.**

The James G. Biddle Co., 1316 Arch St., Philadelphia, has acquired from **The Foxboro Co.** the facilities for servicing of the imported **Dr. Th. Horn** portable tachometers.

Ampco Metal Inc., Milwaukee, has appointed **The John C. Fitzpatrick Co.,** Toronto, Ont., as its sales agent in the province of Ont. **The Anstice Co.,** Rochester, N. Y., has been named Ampco agent in western N. Y.

Wilhagen Machine & Supply Co., 224 So. Third St., St. Joseph, Mo., has been incorporated by **Ludwig** and **Ernest Wilhagen.**

J. & A. Keller Machine Co., Inc., has been incorporated in Buffalo with a capitalization of $100,000 by **Arthur, Arthur P. Keller** and **Marie L. Mott.**

The Viking Tool and Manufacturing Corp., Conklin, N. Y., has been formed with a capitalization of $100,000 by **Hans A. Holmberg, Gertrude Holmberg** and **Nathan W. Rankin.**

Pennsylvania Flexible Metallic Tubing Co., Philadelphia, has opened a warehouse and sales office at 4352 W. Harrison St., Chicago.

Clements Welding Supply Co., Inc., 709 Academy St., St. Louis, Mo., has been incorporated by **D. A. Sally, Maxine and George Clements.**

Stanley Electric Tools Div., Stanley Works, New Britain, has moved into its new six-story plant at 480 Myrtle St.

MEETINGS

American Gear Manufacturers Association. 31st annual meeting. The Homestead, Hot Springs, Va. June 2-4. Newbold C. Goin, executive secretary, Empire Bldg., Pittsburgh 22, Pa.

American Management Association. General management meeting. Waldorf-Astoria Hotel, New York N. Y. June 11-12. Edward K. Moss, director of public relations, 330 W. 42 St., New York 18, N. Y.

American Society for Quality Control. Annual convention and Midwest Quality Control Conference. Hotel Sherman, Chicago, Ill. June 5-6. Edward D. Thompson, general chairman, P. O. Box 1097, Chicago 90, Ill.

American Society for Testing Materials. Annual meeting. Chalfonte-Haddon Hall, Atlantic City, N. J. June 16-20. R. J. Painter, 1916 Race St., Philadelphia 3, Pa.

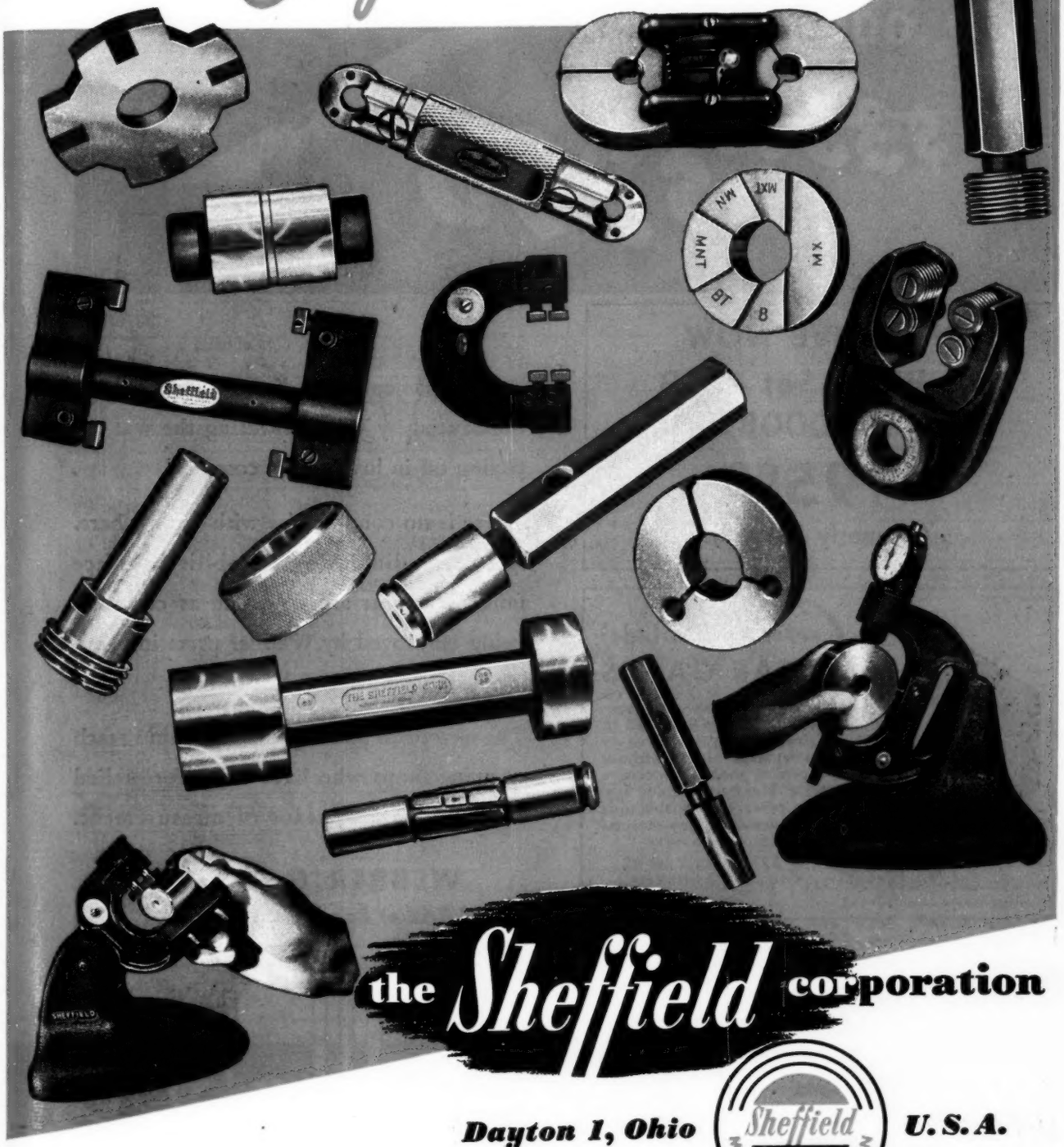
American Society of Mechanical Engineers. Semi-annual meeting. Stevens Hotel, Chicago, Ill. June 15-19. Ernest Hartford, executive assistant secretary, 29 W. 39 St., New York 18, N. Y.

Machinery Dealers National Association. Convention. Netherlands Plaza Hotel, Cincinnati, Ohio. June 17-19. R. K. Vinson, executive director, 20 N. Wacker Dr., Chicago 6, Ill.

Metal Powder Association. Annual spring meeting. Waldorf-Astoria Hotel. New York, N. Y. May 27. Association Headquarters, 420 Lexington Ave., New York, N. Y.

Society of Automotive Engineers. Summer meeting. French Lick Springs Hotel, French Lick, Ind. June 1-6. John A. C. Warner, general manager, 29 W. 39 St., New York, N. Y.

Sheffield quality assures low cost *Gage Performance*



the *Sheffield* corporation

Dayton 1, Ohio Sheffield MASTER CRAFTSMEN ***U. S. A.***

{ *Standard Gages Shipped in 24 Hours* }

2584

EFFECTIVE
JUNE 1st, 1947

WEBBER GAGE
84 BLOCK SET–84A
± .000004"

~~$350~~ $295

EFFECTIVE NOW
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± .000008"
$195.00
(Formerly $235.00)

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WEAR GAGES

Webber Carblox wear gages are specifically designed to permit frequent use of master gage blocks without exposing them to excessive wear. The hard carbide surface of carblox withstands daily use for many months with virtually no wear.

- $21.50 for a set of two (.100") with case.

The refinements and dimensional controls introduced by Webber during the war are paying off in lower gage costs today.

There is no compromise with quality here. Accuracy, dimensional stability, surface finish and wear are the same as currently being employed by Webber users in thousands of shops from coast to coast.

The new price places precision within reach of many shops who have heretofore relied on less accurate means of measurement.

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WEBBER MAKES PRECISION GAGE BLOCKS EXCLUSIVELY

- ★ Gage Block Sets in Steps of .00005".
- ★ Individual Special Size Blocks.
- ★ Heavy Duty Gage Blocks.
- ★ Angle Gage Blocks in Steps of one second.
- ★ Carblox (Carbide) Wear Gages.

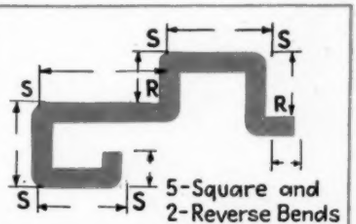
Webber
PRECISION
GAGE BLOCKS

Allowances for 90° Bends in Sheet Steel—III

BY ALF J. ABRAHAMSEN, VIRGINIA METAL PRODUCTS CORPORATION

TO DETERMINE CUTTING SIZE OF SHEET STEEL

Add all the dimensions which must be on one side of sheet. Then deduct the dimension in the table which corresponds to the allowance for the combination of the square bends and reverse bends under consideration.



5-Square and 2-Reverse Bends

SQUARE		0	1						
REVERSE		1	0	1	2	3	4	5	6
GA.	DEC.	+ CONSTANT → 0.40	1.60	1.20	0.80	0.40	0.00	+0.40	+0.80
24	0.0239	+0.0096	0.038	0.029	0.019	0.0096	—	+0.0096	+0.019
22	0.0299	+0.0120	0.048	0.036	0.024	0.0121	—	+0.0121	+0.024
20	0.0359	+0.014	0.057	0.043	0.029	0.014	—	+0.014	+0.029
18	0.0478	+0.019	0.076	0.057	0.038	0.019	—	+0.019	+0.038
16	0.0598	+0.024	0.096	0.072	0.048	0.024	—	+0.024	+0.048
14	0.0747	+0.030	0.120	0.090	0.060	0.030	—	+0.030	+0.060
13	0.0897	+0.036	0.143	0.108	0.072	0.036	—	+0.036	+0.072
12	0.1046	+0.042	0.167	0.126	0.084	0.042	—	+0.042	+0.084
11	0.1196	+0.048	0.191	0.144	0.096	0.048	—	+0.048	+0.096
10	0.1345	+0.054	0.215	0.161	0.108	0.054	—	+0.054	+0.108

SQUARE		0	2						
REVERSE		2	0	1	2	3	4	5	6
GA.	DEC.	+0.80	3.20	2.80	2.40	2.00	1.60	1.20	0.80
24	0.0239	+0.019	0.076	0.067	0.057	0.050	0.038	0.029	0.019
22	0.0299	+0.024	0.096	0.083	0.071	0.060	0.048	0.036	0.024
20	0.0359	+0.029	0.115	0.100	0.086	0.071	0.057	0.043	0.029
18	0.0478	+0.038	0.153	0.133	0.114	0.095	0.076	0.057	0.038
16	0.0598	+0.048	0.192	0.167	0.143	0.120	0.096	0.072	0.048
14	0.0747	+0.060	0.240	0.210	0.180	0.150	0.120	0.090	0.060
13	0.0897	+0.072	0.287	0.251	0.215	0.180	0.143	0.108	0.072
12	0.1046	+0.084	0.334	0.292	0.251	0.210	0.167	0.126	0.084
11	0.1196	+0.096	0.382	0.334	0.287	0.240	0.191	0.144	0.096
10	0.1345	+0.108	0.430	0.377	0.322	0.270	0.215	0.161	0.108

SQUARE		0	3						
REVERSE		3	0	1	2	3	4	5	6
GA.	DEC.	+ CONSTANT → 1.20	4.80	4.40	4.00	3.60	3.20	2.80	2.40
24	0.0239	+0.029	0.114	0.105	0.095	0.086	0.076	0.070	0.057
22	0.0299	+0.036	0.143	0.131	0.119	0.107	0.096	0.083	0.071
20	0.0359	+0.043	0.172	0.157	0.143	0.129	0.114	0.100	0.086
18	0.0478	+0.057	0.230	0.210	0.191	0.172	0.152	0.133	0.114
16	0.0598	+0.072	0.287	0.263	0.239	0.215	0.191	0.167	0.143
14	0.0747	+0.090	0.358	0.328	0.298	0.268	0.240	0.210	0.180
13	0.0897	+0.108	0.430	0.394	0.358	0.322	0.287	0.251	0.215
12	0.1046	+0.126	0.502	0.460	0.418	0.377	0.334	0.292	0.251
11	0.1196	+0.144	0.574	0.526	0.478	0.430	0.382	0.334	0.287
10	0.1345	+0.161	0.645	0.591	0.538	0.484	0.430	0.377	0.322

SQUARE		0	4						
REVERSE		4	0	1	2	3	4	5	6
GA.	DEC.	+1.60	6.40	6.00	5.60	5.20	4.80	4.40	4.00
24	0.0239	+0.038	0.152	0.143	0.133	0.124	0.114	0.105	0.095
22	0.0299	+0.048	0.191	0.180	0.167	0.155	0.143	0.131	0.119
20	0.0359	+0.057	0.230	0.215	0.201	0.187	0.172	0.157	0.143
18	0.0478	+0.076	0.306	0.287	0.268	0.249	0.229	0.210	0.191
16	0.0598	+0.096	0.382	0.360	0.334	0.310	0.287	0.263	0.239
14	0.0747	+0.120	0.478	0.448	0.418	0.388	0.360	0.328	0.298
13	0.0897	+0.143	0.574	0.538	0.502	0.466	0.430	0.394	0.358
12	0.1046	+0.167	0.670	0.628	0.585	0.544	0.502	0.460	0.418
11	0.1196	+0.191	0.765	0.718	0.670	0.621	0.574	0.526	0.478
10	0.1345	+0.215	0.860	0.807	0.753	0.699	0.645	0.591	0.538

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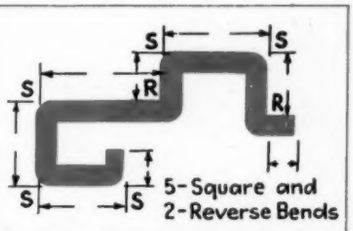
LEBLOND

Allowances for 90° Bends in Sheet Steel—IV

TO DETERMINE CUTTING SIZE OF SHEET STEEL

Add all the dimensions which must be on one side of sheet. Then deduct the dimension in the table which corresponds to the allowance for the combination of the square bends and reverse bends under consideration.

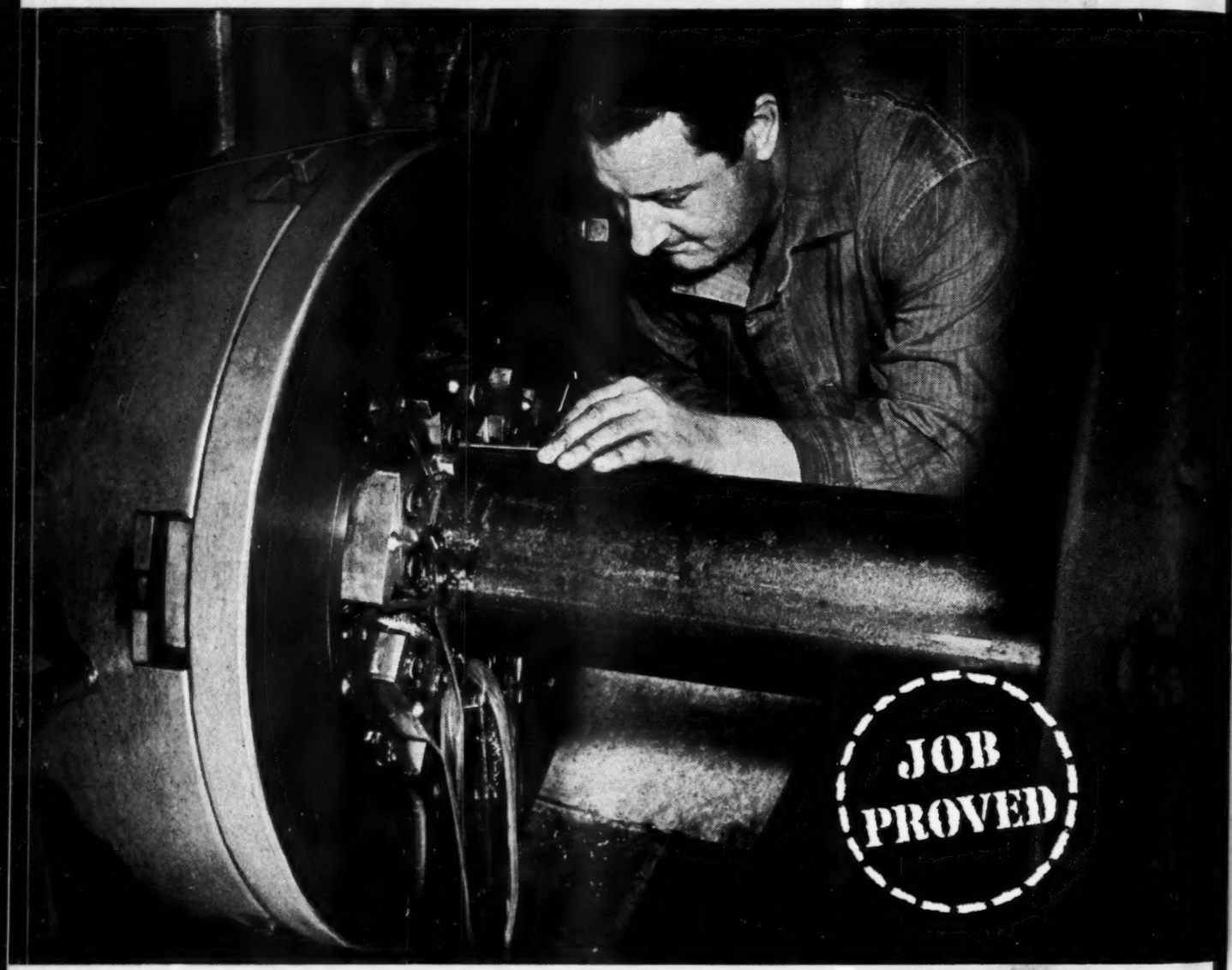


5-Square and 2-Reverse Bends

SQUARE		0	5						0	6						
REVERSE		5	0	1	2	3	4	5	6	6	0	1	2	3	4	5	6
GA.	DEC.	+ CONSTANT → 2.00	8.00	7.60	7.20	6.80	6.40	6.00	5.60	+ 2.40	9.60	9.20	8.80	8.40	8.00	7.60	7.20
24	0.0239	+0.050	0.191	0.181	0.172	0 162	0.152	0.143	0.133	+0.057	0.230	0.220	0.210	0.200	0.191	0.181	0.172
22	0.0299	+0.060	0.240	0.227	0.215	0.203	0.191	0.180	0.167	+0.071	0.287	0.275	0.263	0.251	0.240	0.227	0.215
20	0.0359	+0.072	0.290	0.272	0.258	0.244	0.230	0.215	0.201	+0.086	0.344	0.330	0.315	0.301	0.287	0.272	0.258
18	0.0478	+0.095	0.382	0.363	0.344	0.325	0.306	0.287	0.268	+0.114	0.459	0.440	0.420	0.401	0.382	0.363	0.344
16	0.0598	+0.120	0.480	0.454	0.430	0.407	0.382	0.360	0.334	+0.143	0.574	0.550	0.526	0.502	0.478	0.454	0.430
14	0.0747	+0.150	0.600	0.568	0.538	0.508	0.478	0.448	0.418	+0.180	0.717	0.687	0.657	0.627	0.600	0.568	0.538
13	0.0897	+0.180	0.717	0.681	0.646	0.610	0.574	0.538	0.502	+0.215	0.861	0.825	0.790	0.753	0.717	0.681	0.646
12	0.1046	+0.210	0.840	0.794	0.753	0.711	0.670	0.630	0.585	+0.251	1.00	0.962	0.920	0.879	0.837	0.794	0.753
11	0.1196	+0.240	0.960	0.910	0.861	0.813	0.765	0.718	0.670	+0.287	1.14	1.10	1.05	1.00	0.957	0.910	0.861
10	0.1345	+0.270	1.08	1.02	0.968	0.914	0.860	0.807	0.753	+0.322	1.30	1.23	1.18	1.12	1.08	1.02	0.968

SQUARE		0	7						0	8						
REVERSE		7	0	1	2	3	4	5	6	8	0	1	2	3	4	5	6
GA.	DEC.	+ CONSTANT → 2.60	11.20	10.80	10.40	10.00	9.60	9.20	8.80	+ 3.00	12.80	12.40	12.00	11.60	11.20	10.80	10.40
24	0.0239	+0.067	0.267	0.258	0.248	0.240	0.230	0.220	0.210	+0.076	0.305	0.296	0.286	0.277	0.267	0.258	0.248
22	0.0299	+0.084	0.334	0.322	0.310	0.300	0.287	0.275	0.263	+0.096	0.382	0.370	0.358	0.346	0.334	0.322	0.310
20	0.0359	+0.100	0.402	0.387	0.373	0.359	0.344	0.330	0.315	+0.115	0.460	0.445	0.430	0.416	0.402	0.387	0.373
18	0.0478	+0.134	0.535	0.516	0.497	0.478	0.460	0.440	0.420	+0.153	0.611	0.592	0.573	0.554	0.535	0.516	0.497
16	0.0598	+0.167	0.669	0.645	0.621	0.598	0.574	0.550	0.526	+0.191	0.765	0.741	0.717	0.693	0.669	0.645	0.621
14	0.0747	+0.209	0.836	0.806	0.776	0.747	0.717	0.687	0.657	+0.239	0.956	0.926	0.896	0.866	0.836	0.806	0.776
13	0.0897	+0.251	1.00	0.968	0.932	0.897	0.861	0.825	0.790	+0.287	1.14	1.11	1.07	1.04	1.00	0.968	0.932
12	0.1046	+0.293	1.17	1.12	1.08	1.04	1.00	0.962	0.920	+0.335	1.33	1.29	1.25	1.21	1.17	1.12	1.08
11	0.1196	+0.335	1.34	1.29	1.24	1.19	1.14	1.10	1.05	+0.383	1.53	1.48	1.43	1.38	1.34	1.29	1.24
10	0.1345	+0.377	1.50	1.45	1.40	1.34	1.30	1.23	1.18	+0.403	1.72	1.66	1.61	1.56	1.50	1.45	1.40

Cutting Better Threads...Faster



SUNICUT 196...

Speeds Up Threading of Automatic Sprinkler Pipes, Improves Quality of Threads

Here is a case where a big manufacturer of automatic fire-sprinkler systems increased production and improved his threads by replacing a special, expensive oil with Sunicut 196.

Machine: No. 5 Landis Pipe-Threading Machine.
Operation: Threading ⅜" to 8" Pipe. **Lubricant:** Sunicut 196.

In this case, a saving of 15% in oil costs resulted. This is a typical example of how Sun's "Job-Proved" cutting oils have aided in speeding up production and in reducing costs.

Machine-tool operators prefer Sunicut because it is a clear, transparent, free-flowing, sulphurized mineral oil. Sunicut is recommended for those exacting jobs where an emulsifiable cutting oil is not suitable.

Other "Job-Proved" Sunicut grades are suitable for use on automatic lathes, gear-cutters, etc. Contact the nearest Sun office for recommendations.

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SUNOCO
INDUSTRIAL PRODUCTS

Magnesium Extruded Round Tubing

Tentative specification: B217-46T, issued by American Society for Testing Materials

Four types of alloys are specified and are designated as alloys Nos. AZ31X, AZ61X, AZ80X, and M1.

The tubing shall conform to the requirements as to chemical composition prescribed in Table I.

The chemical analysis shall be made in accordance with the Standard Methods of Chemical Analysis of Magnesium and Magnesium-Base Alloys (A.S.T.M. Designation: E35), or the Tentative Photometric Methods for Chemical Analysis of Magnesium and Magnesium-Base Alloys (A.S.T.M. Designation: E61), or by any other approved methods agreed upon by the manufacturer and the purchaser. The analysis may be made spectrographically, provided that, in case of dispute, the results secured by Method E35 shall be the basis for acceptance.

The tubing shall conform to the requirements as to tensile properties prescribed in Table II.

Test Specimens

Tension test specimens from tubes 2 in. or less in outside diameter shall be of the full section of the tube unless the limitations of the testing machine preclude the use of such a specimen. Specimens of the type shown in Figs. 1 or 2 may be used for tubes over 2 in. in diameter, or in those cases when a full-section specimen cannot be used: small size specimens with dimensions proportional to those shown in Fig. 2 may be used when necessary.

For tubes having a nominal weight of less than 1 lb. per lineal foot, the tension test specimen shall be taken for each shipment of 500 lb. or less; for larger shipments, an additional specimen shall be taken for each 1000 lb. or fraction thereof in excess of the first 500 lb. For tubes having a nominal weight of 1 lb. or more per lineal foot, one tension test specimen shall be taken for each shipment of 500 ft. or less; for larger shipments, an additional specimen shall be taken for each 1000 ft. or fraction thereof in excess of the first 500 ft.

The tension tests shall be made in accordance with the Standard Methods of Tension Testing of Metallic Materials (A.S.T.M. Designation: E8).

Straightness—Tubing larger than ⅜ in. in outside diameter shall not vary from straight by an amount greater than one part in 960 parts (0.0625 in. in 5 ft.). Tubing ⅜ in. or less shall be free from kinks.

TABLE I—CHEMICAL REQUIREMENTS

Alloy	Magnesium per cent	Aluminum per cent	Manganese min., per cent	Zinc, per cent	Silicon, max., per cent	Copper, max., per cent	Nickel, max., per cent	Iron, max., per cent	Calcium, max., per cent	Other Elements max., per cent
AZ31X	remainder	2.5 to 3.5	0.20	0.6 to 1.4	0.3	0.05	0.005	0.005	...	0.3
AZ61X	remainder	5.8 to 7.2	0.15	0.4 to 1.5	0.3	0.05	0.005	0.005	...	0.3
AZ80X	remainder	7.8 to 9.2	0.12	0.2 to 0.8	0.3	0.05	0.005	0.005	...	0.3
M1	remainder	.....	1.20	.....	0.3	0.05	0.01	...	0.3	0.3

Note 1.—Analysis shall regularly be made only for the elements specifically mentioned in this table. If, however, the presence of other elements is suspected, or indicated in the course of routine analysis, further analysis shall be made to determine that the total of these other elements is not in excess of the limits specified in the last column of the table.

Note 2.—The following applies to all specified limits in this table: For purposes of acceptance and rejection, and observed value or a calculated value obtained from analysis should be rounded off to the nearest unit in the last right-hand place of figures used in expressing the specified limit.

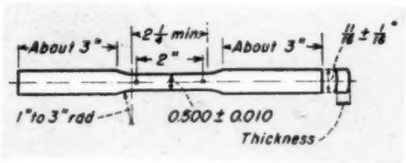
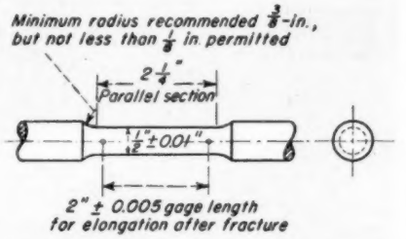


Fig. 1—Longitudinal Tension Test Specimen for Large Diameter Tubular Products


Minimum radius recommended ⅜-in., but not less than ¼ in permitted
2¼"
Parallel section
½" ± 001"
2" ± 0.005 gage length for elongation after fracture

Note: The gage length, parallel section, and fillets shall be as shown, but the ends may be of any shape to fit the holders of the testing machine in such a way that the load shall be axial.

Fig. 2—Standard Round Tension Test Specimen with 2-in. Gage Length

TABLE II—TENSILE REQUIREMENTS

Alloy	Wall Thickness, in.	Tensile Strength, min., psi.	Yield Strength[a] (0.2 per cent offset), min., psi	Elongation in 2 in., min., per cent
AZ31X	0.050 to 0.250[b]	34 000	16 000	8
AZ61X	0.050 to 0.250[b]	36 000	16 000	7
AZ80X	0.050 to 0.250[b]	38 000	17 000	5
M1	0.050 to 0.250[b]	28 000	—	2

TABLE III—PERMISSIBLE VARIATIONS IN DIAMETER

Specified Diameter, In.	Deviation Mean Diameter[a] From Specified Diameter	Deviation of Diameter at Any Point From Specified Diameter[b]
0.999 and under	0.010	0.020
1.000 to 1.999	0.012	0.025
2.000 to 3.999	0.015	0.030
4.000 to 5.999	0.025	0.050
6.000 to 7.999	0.037	0.075
8.000 to 9.999	0.045	0.100

[a]The "mean diameter" is determined by the average of two measurements taken at right angles to each other.

[b]Not applicable, if the wall thickness is less than 2.5% of the outside diameter.

TABLE IV—PERMISSIBLE VARIATIONS IN WALL THICKNESS

Specified Thickness, in.	Permissible Variations in Wall Thickness, plus or minus, in.				
	Deviation of Mean Wall Thickness[a] from Specified Wall Thickness				Deviation of Wall Thickness at Any Point from Specified Wall Thickness
	Outside Diameter, 0.99 in. and under	Outside Diameter, 1 to 2.99 in.	Outside Diameter, 3 to 4.99 in.	Outside Diameter, 5 in. and over	
0.062 & under	0.006	0.007	0.008	0.010	10 per cent of the mean wall thickness,[a] with a maximum of 0.060 and a minimum of 0.010
0.063 to 0.124	0.007	0.008	0.010	0.015	
0.125 to 0.249	0.008	0.009	0.013	0.020	
0.250 to 0.374	.....	0.011	0.016	0.025	
0.375 to 0.499	.....	0.015	0.021	0.035	
0.500 to 0.749	.....	0.020	0.028	0.045	
0.750 to 0.999	.....	.....	0.035	0.055	
0.000 to 1.499	.....	.....	0.045	0.065	

[a]The "mean wall thickness" is determined by the average of two measurements taken at 180 deg. to each other.

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Shop Equipment News

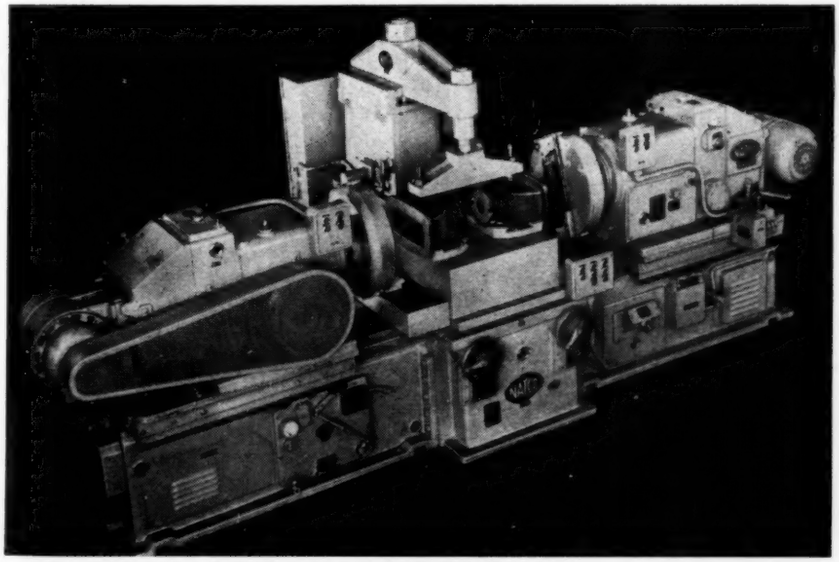
National Automatic Tool Machine Bores, Faces Large Awkward Parts

The Natco A-20 Borface machine is announced by National Automatic Tool Co., Inc., Dept. 20, Richmond, Ind. To be displayed at the Machine Tool Builders Show in Chicago, the machine is designed to permit precision boring and facing of parts too large and awkward to handle or swing on boring mills and lathes. It can be used by semi-skilled operators.

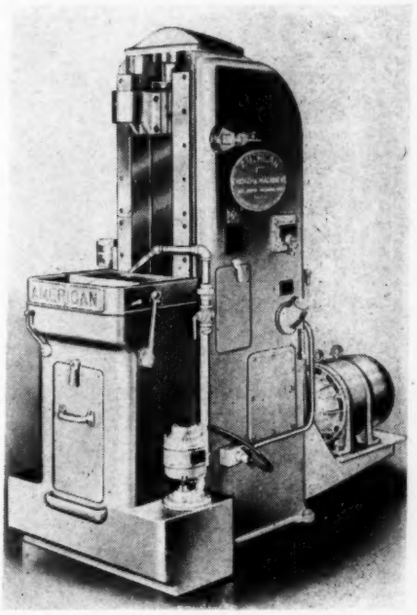
The machine consists of either A-20A or A-20B units mounted vertically, horizontally or at an angle to make up multi-way boring machines. All A-20 Borface units are provided with heavy-duty spindles mounted on preloaded bearings, with worm and gear driven by V-belt drive. The difference between the A-20A and A-20B model is that the "B" unit provides automatic cross-facing drive and control which is inserted between the spindle-drive motor and spindle unit. "B" units also permit operating on more than one face at a time by means of way-type application.

The "B" unit illustrated combines two Borface units horizontally to face two valve bonnets simultaneously. It was originally fabricated to face both ends of valve bodies at the same time. After work is loaded onto matrix-type locating fixtures, a pushbutton activates an automatic clamping cycle during which the clamping arms swing forward through 90° into position over the work, then lower under hydraulic pressure to equalize and clamp. Either high-speed steel or alloy-tipped standardized bit stock is employed, reducing tooling costs and sharpening time, and eliminating the need for bump-facing cutters.

Various types of workheads permit a combination of turning, boring, cross-facing, undercutting and other operations.



Two bonnet parts are rough and finish faced in 2 min. on this A-20B Borface machine. A V-type cut finish is given to each face



An integral motor and centrifugal-pump unit on the side of this broacher supplies coolant from the reservoir

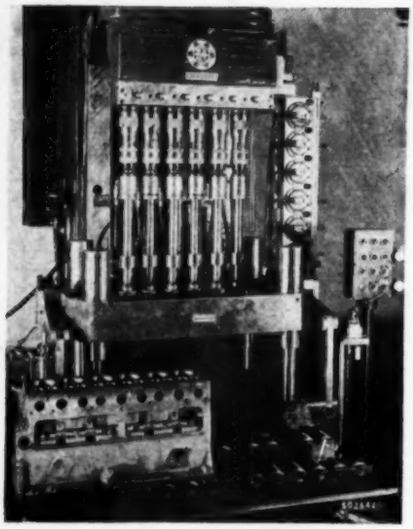
Type T 3-way Broaching Machine Has Improved Coolant Assembly

Improvements in the design of the vertical hydraulic Type T 3-way broaching machine are announced by American Broach & Machine Co., 541 W. Huron St., Ann Arbor, Mich. Major change is in the coolant assembly, minor changes are in the worktable.

Coolant is supplied from an enlarged reservoir in the worktable base, and the coolant-discharge pipe extends 8 in. above the worktable with shut-off valve at table height. The coolant-pump motor is push-button controlled, and the inlet pipe has a screen to weed out large chips. The pump unit can be taken out by removing four screws and disconnecting inlet and discharge pipes.

Adaptable to push, pull and surface broaching, the machine is made in 4-, 6- and 8-ton sizes with 24-in. stroke, and 6-, 10- and 15-ton sizes with 36-in. stroke. It also is used for straightening, arbor and assembly work.

Micromatic Honing Tool and Head Automatically Controls Bore Size



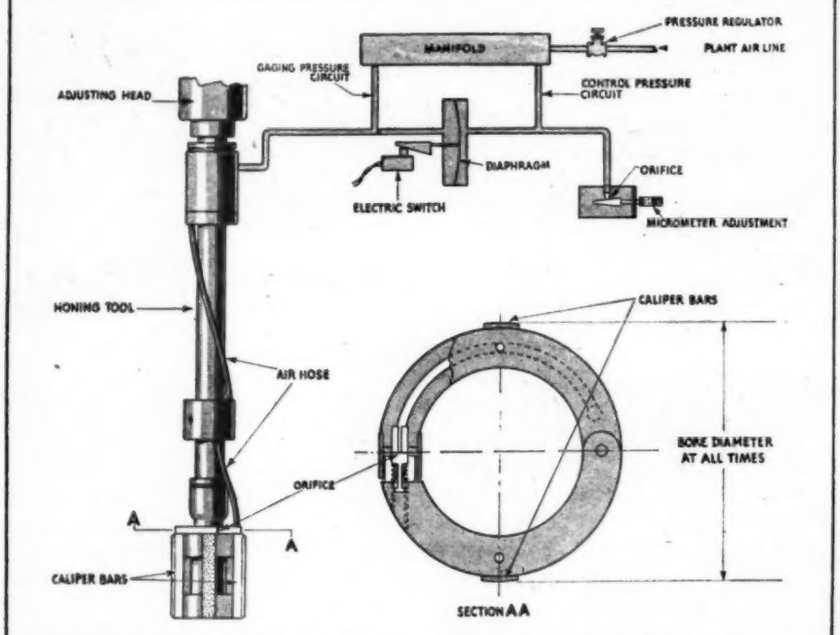
Feed-out, collapse, withdrawal of tool and compensation for abrasive wear are automatic on this honing unit

A honing tool and head that automatically controls the finished bore size of automotive cylinders has been announced by Micromatic Hone Corp., 8100 Schoolcraft Ave., Detroit 4, Mich. The development is said to eliminate or materially reduce selective fitting of pistons in cylinder bores. It can be applied to all types of bores over 2-in. dia.

An application of the method is the Barnsdril honing machine illustrated. Equipped with a Micromatic Hydrosize six-spindle head, tools and fixtures, it has a 30-sec. honing cycle. It removes an average 0.004-in. stock from each of six bores, corrects "out-of-roundness" and taper, and is said to hold the bore size to not over 0.0005-in. variation.

Two developments make the method possible. One is controlled positive feed-out of the tool. The tool expands at controlled rate by means of a hydraulic cylinder, and expansion may be adjusted so that high spots are honed before stock is removed from large parts of the bore.

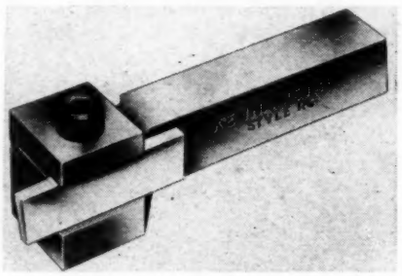
The other development is the Hydrosize automatic size control. An air gage built into the honing tool drops in pressure in proportion to stock removed from the bore. When the pressure drops to a predetermined point, because the bore has been honed to desired size, the honing cycle is automatically completed.



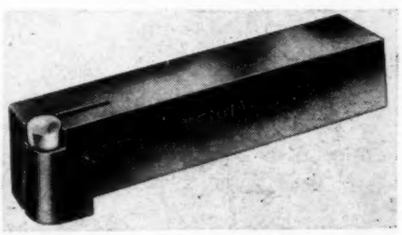
Hydrosize automatic sizing device operates on air taken from the plant line and reduced to approximately 6 psi. The air is put through venturi fittings into two circuits that are independent of each other, except that any variation in the air supply affects both equally. Pressure in each circuit is controlled by rate at which air is allowed to escape from it and is not affected by conditions in the other circuit. A micrometer-adjusted metering valve controls pressure in the control circuit. In the gaging circuit, pressure is controlled by two "caliper bars" which measure bore dia. The orifices in the circuits are adjusted so the gaging-circuit pressure is greater than control-circuit pressure when bore is smaller than desired size. When bore reaches size, pressure drops in the gaging circuit, the diaphragm moves and activates an electric switch, and the tool ceases expansion. The tool is then collapsed and withdrawn.

Two Lines of Kennametal Tools Incorporate Clamped-in Inserts

Two lines of tools with clamped-in Kennametal inserts are announced by Kennametal, Inc., Latrobe, Pa.



One line, Style RG (right-hand) and LG (left-hand) comprises an advanceable blade clamped in a heat-treated steel holder. Used for single-grooving or cut-off operations, the blade can be reground many times. RG and LG toolholders hold blades 0.080 to 0.149 in. thick in the smallest size, and 0.150 to 0.250 in. thick in two larger sizes. Standard blades are 2½ to 4 in. long, have zero side rake and cutting-edge angle.

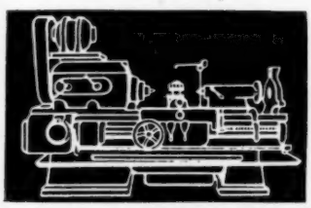


The other line has a solid, round clamped-in insert supported by a back-up adjusting screw. Used for repetitive jobs requiring complex tool setups, the insert can be indexed several times to present new edges, and then turned end-for-end. Known as Style 3RS (right-hand) and 6RS (left-hand), the smaller holders take round inserts ⅜-in. in dia. and ¾ in. long, and larger holders take ½-in. dia., 1 in. long.

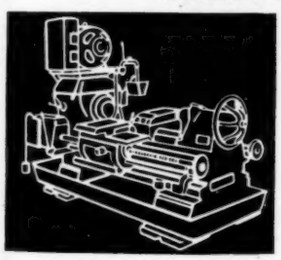
and the front office says

Shifts 2 & 3
Increasing Production 138%
Time Saved 25%
No Major Overhaul in 14 months
Cutting Operation Time by 58%
Output Increased 25%

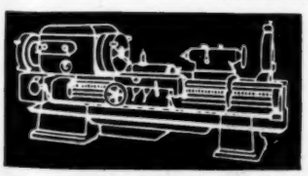
Lodge and Shipley Lathes look *even better* on the Profit Sheet!



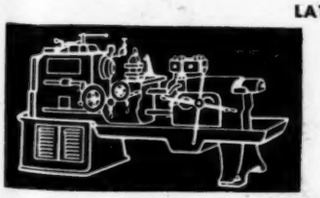
ENGINE, TOOL ROOM AND MANUFACTURING LATHES



2A and 3A DUOMATIC (automatic) LATHES



HOLLOW SPINDLE LATHES



TURRET LATHES

● Just as operators and supervisors approve operating advantages of new Lodge & Shipley Lathes, so top management appreciates their remarkable profit records.

In the front office . . . where production and cost figures get the final going-over . . . you'll find Lodge & Shipley boosters, too!

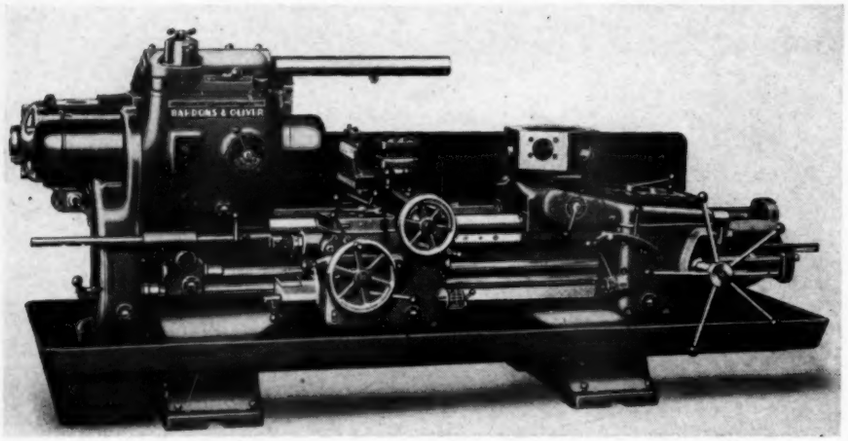
The records shown in the illustration are authentic, taken from reports of Lodge & Shipley Lathe Owners*. . . indicating the exceptional results obtained in plants of every type and size.

Lodge & Shipley Engineers will be glad to help you check your present lathe production costs against actual comparable costs for the new Lodge & Shipley Lathes . . . show you how to check sharply mounting cost trends. Write for Condensed Catalog showing the complete Lodge & Shipley line.

*Names and additional data on request.

THE Lodge & Shipley COMPANY
CINCINNATI 25, OHIO
MACHINE TOOL DIVISION • 3055 COLERAIN
SPECIAL PRODUCTS DIVISION • 800 EVANS ST.

Bardons & Oliver Turret Lathe Provides Instant Speed Change



Wide application of hydraulics is incorporated into the No. 22 by means of a geared pump integral with the head

The No. 22 saddle-type turret lathe has been announced by Bardons & Oliver Inc., 1133 W. 9th St., Cleveland 13, Ohio. Built for 3½- and 4½-in. bar capacities, the machine has 15½-in. swing over cross-slide and 23½-in. swing over the guides of the bridge-type carriage. It can be equipped with a 15-in. heavy-duty scroll chuck for chucking work.

A flange-mounted motor eliminates belts and pulleys, and high ventilation permits greater sustained overload. A hydraulic selector valve on the top of the head housing indicates spindle speed in rpm. and cutting speed in fpm. The twelve preselective speed changes are in geometrical progression.

The single lever on the head controls start, stop, reverse, spindle brake and gear shifting. These functions are performed by hydraulic power, as is the operation of the multiple-disk forward and reverse clutches.

Speed changes can be made instantly without waiting for gears or spindle to slow down. A centrifugal governor applies the hydraulic multiple-disk brake and slows down the gears to proper speed. Power actuation of the collet chuck and bar feed provides powerful gripping of the bar and easy manipulation. A toggle mechanism multiples the hydraulic power from the pump to increase bar grip.

The hexagon turret is mounted on a long saddle, and opening of the ring-type binder, indexing and locking are by hydraulic power controlled by a lever on the saddle. Power rapid travel for the saddle on the bed, the carriage longitudinally and the cross-slide in and out is by means of an electric motor housed in the bed underneath the head.

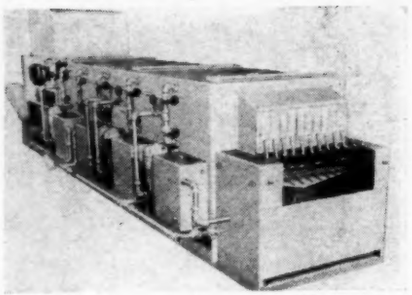
Nine feed changes for each apron are pre-set on dial drums, and feed gears are shifted by hydraulic power and controlled by a small lever at the end of the drum. A sliding gear cluster in the head-end gear box makes two feed ranges or 18 changes available.

The square turret is indexed, locked and clamped by a lever on the cross-slide. The rear of the slide is adapted to take one of a variety of toolposts, thus permitting cutters to be mounted at the front and rear of work. The large diameter overhead pilot bar forms a support for the hexagon-turret tools.

Individualized automatic lubrication systems serve units of the machine such as the head, head-end gear box, cross-slide, saddle, turret, carriage and tail bracket. Bearings, gears and parts in the two aprons are spray lubricated by integral reservoirs and systems.

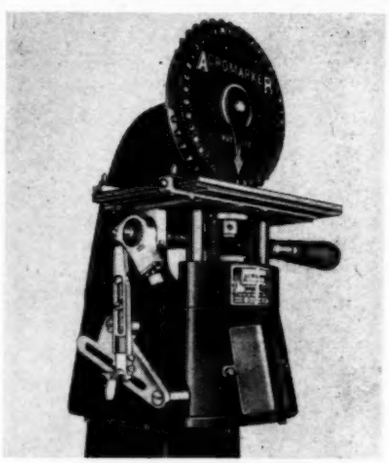
Optimus Conveyor-Type Machine Washes, Processes Metal Parts

The WRDXHCF flat conveyor-type washing machine for cleaning and processing metal parts prior to plating has been developed by Optimus Equipment Co., 151 Church St., Matawan, N. J. The machine is 35 ft. long, 6 ft. wide and 7 ft. high.



Parts go through seven consecutive operations: hot alkali wash. drain, hot water rinse, warm cyanide wash, cold rinse to sewer, hot rinse, dry. The hot rinses are hooked in sequence for operating saving. The machine has a belt speed of 4 fpm. and produces over 100 parts per min. The conveyor can also be built with flight bars for baskets or individual pieces, or with a mesh belt for parts in bulk.

Acromark Nameplate Machine Has New Clutch Construction



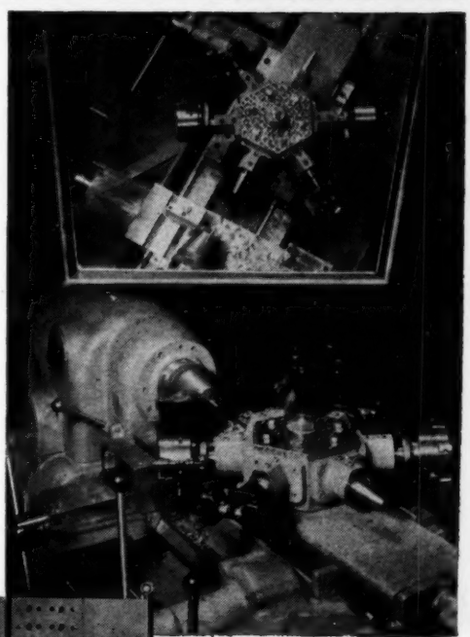
The No. 1F nameplate-stamping machine, made by The Acromark Co., 7-13 Morrell St., Elizabeth 4, N. J., has been improved with a combination feature. A new clutch incorporates a lever-operation movement controlled by a thumbscrew. It is used in conjunction with and connected to an additional lever arrangement that determines the stroke by simple adjustment of a wing-nut which advances or retards in an elongated slot. The operator can set character advance to suit any size of characters by one adjustment of the wing-nut. The combination is available in all foot-operated Acromarker models and gives automatic spacing.

Also announced are Acroboss "Vari-Angle" embossing dies for raised or sunk lettering or design on metals that are difficult to draw.

FINISHED LOCK-SCREWS—

One Every 31.2 Seconds

Part—Lock Screw; Material—Brass, ⅜" Bar Stock; Preselected Spindle Speeds—4; Hex Turret tooled for duplicate cycle; Time per piece—31.2 seconds; Setup time—32 minutes.



Will your present hand screw machine make four cuts—a forming cut, then thread, knurl and cut off—involving spindle speeds as low as 800 rpm and as high as 3,000 rpm—all in only a little more than half a minute?

That's Speedi-Matic production! And that's why this completely electronically controlled Monarch lathe is becoming recognized as "The World's Fastest Hand Screw Machine". On lots of 25 to 500 or more it combines maximum production with extreme accuracy. For complete details ask for bulletin 1901.

FOR PEAK PRODUCTION AT A *PROFIT*
SPECIFY SPEEDI-MATIC

Here's what you get:

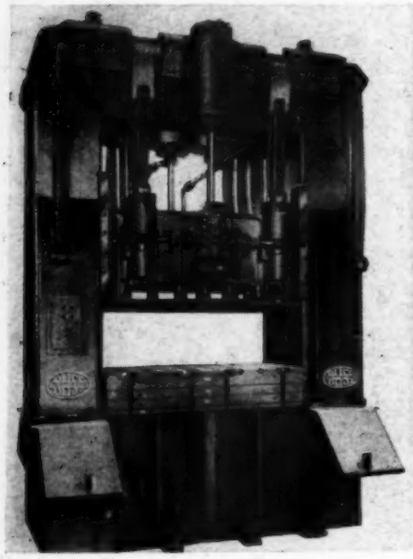
- **Automatic electronic speed change, preselected for as many as ten stations.**
- **Complete range of spindle speeds—50 to 5,000 rpm.**
- **Feeds from .0005" to .016" per revolution.**
- **Hand or power feed ram-type turret.**
- **Quick-acting spring-return, hand-operated cut-off slide.**
- **Air-fed pusher-type collet attachment.**
- **Collet chuck capacity—7/8".**

ACCURACY · ECONOMY · LONG LIFE

Monarch TURNING MACHINES

MONARCH MACHINE TOOL CO. • • • Sidney, Ohio

Bliss Triple-Action Toggle Press Draws Large Automobile Stampings



The toggle-linkage system of this press gives unusually long dwell to blankholder and sufficient dwell to upper plunger to perform redraw work with lower slide

A toggle-press line for triple-action drawing of large automobile stampings is announced by E. W. Bliss Co., 450 Amsterdam Ave., Detroit 2, Mich. Available in a wide range of capacities and in any width, the presses have 4-point suspension on both the upper slides which are timed and mechanically locked with a crank-driven lower plunger in the bed.

The driving mechanism is triple geared and consists essentially of motor, drive shaft and intermediate gearing. Location below the bed permits reduction in the height of the machine and greatly lowers the center of gravity. Greater stability is provided by increased front-to-back footing.

The lower plunger has 22¼-in. stroke, 44½x101-in. area, and 350-ton capacity. It is driven by two main crankshafts supported by individual crowns beneath the press bed.

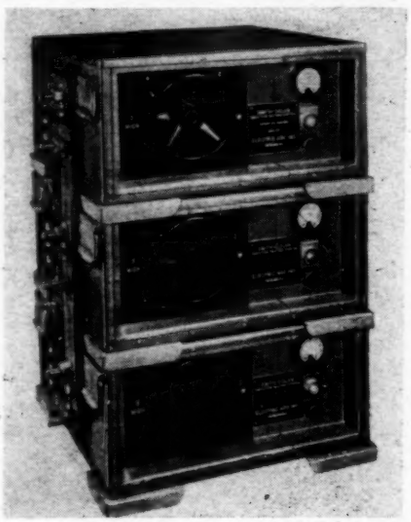
The main gears are mounted on the outer ends of the crankshafts, and they have hubs on each side which are the eccentrics to drive the upper-plunger and blankholder mechanisms. Each corner of the blankholder can be independently power adjusted or synchronized with the other three corners. Stroke of the blankholder is 22 in., with 64x106-in. area and 275-ton capacity at bottom stroke. The upper plunger has 34-in. stroke, 50x95½-in. area and 400-ton capacity.

The slides on all larger machines are counterbalanced. The machine illustrated is driven by a 75-hp. Reliance motor directly connected through the gearing. With 210 in. above floor line, the total height is 367 in. Bliss is also building two presses of 700-ton capacity of similar design with 134- and 180-in. respective width between uprights.

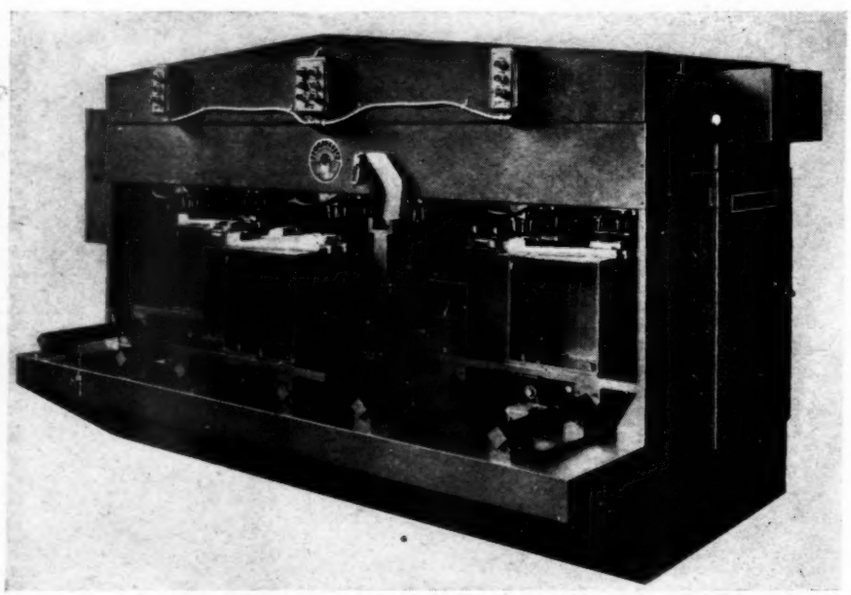
Electric Arc Induction Heater Does Preheating, Normalizing

The Model UP induction heater, an adaption of the Smith-Dolan system, is announced by Electric Arc, Inc., 12 Jelliff Ave., Newark 8, N. J. For preheating and normalizing for welding, the portable heater is manufactured in 10 kva. units which may be stacked to form groups of 2 and 3 units with capacities of 20 and 30 kva. The groups can handle larger dia. work, and it is said that the 30-kva. group illustrated can preheat a 10-in. pipe to 1300 F. in 2 hr.

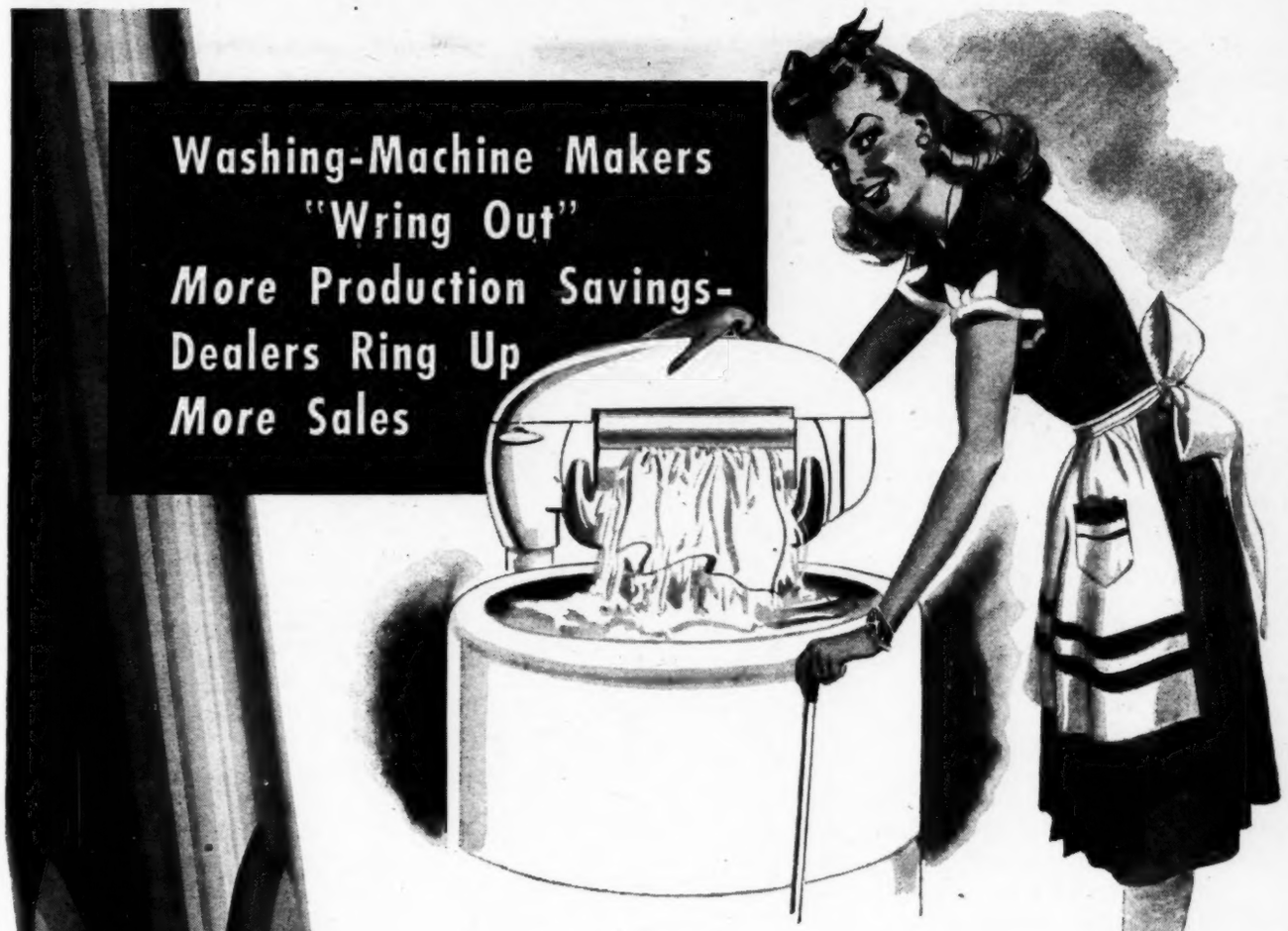
Each unit contains power unit, contactor, meters and control supply. Controlling pyrometers and program controllers can be plugged into the induction heater. The heater can also be used for operations such as shrink-fitting, thawing water lines, drying, and resistance heating for brazing and soldering.



The design is said to eliminate the need for stocking a number of heaters of different capacities.



MULTI-SPOT WELDER—Multiple-transformer automatic spot welder produces 300 steel drawers per hr., 100 each of three different sizes. Machine has three separate units, each with six 14-kva. transformers, each transformer taking care of two welds. All guns can weld simultaneously. Operator loads different size drawers, one per each unit, on fixture. After button is pushed, drawers are automaticlly clamped, rolled into position, welded and returned to unloading position. Made by Progressive Welder Co., 3050 E. Outer Dr., Detroit, Mich.



Washing-Machine Makers "Wring Out" More Production Savings- Dealers Ring Up More Sales

...when costs toboggan and style steps up via AMERICAN PHILLIPS SCREWS

HERE'S THE PRODUCTION "WHY": Super speed on the line—from *automatic*, straight, "non-stop" driving! American Phillips Screws spare work and worker—make power driving really pitch for you in speedier handling . . . in savings on screws (fingers can't fumble, heads can't burr) . . . in scratchless, matchless safety for work surfaces. Many manufacturers making appliances, autos, or what-not, get a bonus in total time-savings up to 50%!

HERE'S THE PROMOTION "WHY": Customers like the streamlined look that this *modern* fastening furnishes. American Phillips Screws go with everything your product embodies that says *high style* and *long service*. Write American today for fastening facts that can cut *your* costs.

AMERICAN SCREW COMPANY, PROVIDENCE 1, RHODE ISLAND

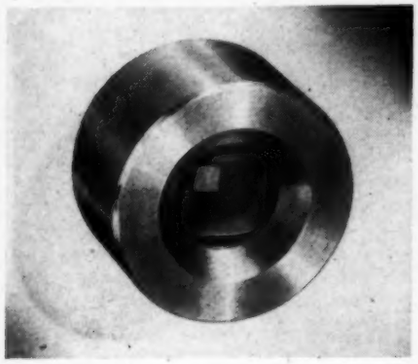
Chicago 11: 589 E. Illinois Street *Detroit 2:* 502 Stephenson Building

AMERICAN PHILLIPS *Screws*

ALL TYPES

ALL METALS: Steel, Brass, Bronze, Stainless Steel, Aluminum, Monel, Everdur (silicon bronze)

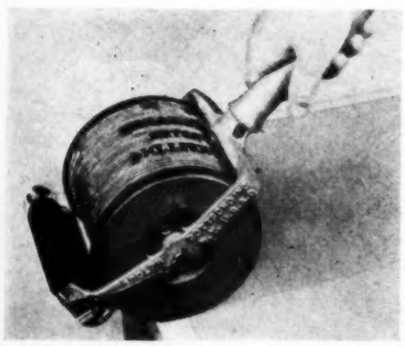
Carboloy Square, Hexagonal Dies Made with Larger Bell Openings



The series "D" line of standard square- and hexagonal-shape dies is announced by Carboloy Co., Inc., Box 237, Roosevelt Park Annex, Detroit 32, Mich. With larger bell openings than the former "R" line, the dies range from 5/32- to 1 5/8-in. hole size for square dies and 5/32 to 1⅞ in. for hexagonal dies.

The enlarged bell opening permits the stock to enter the die carrying a heavier coating of lubricant, and it allows readier access to internal die contours for finishing and servicing than the previous line.

Adolph Gottscho Rolamarker Re-inks Type Automatically

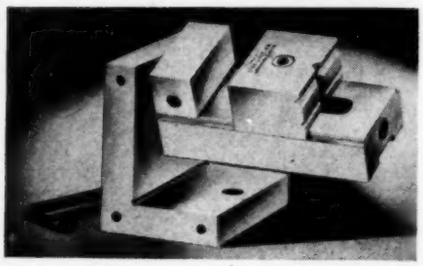


The Rolamarker, a high-speed, manual marking unit, is made by Adolph Gottscho, Inc., 1 Hudson St., New York 13, N. Y. Said to be four times faster than stencilling, the unit marks surfaces including paper, metal and plastics. Available in three sizes, it affords impressions up to 5x12-in. area.

Interchangeable rubber type and type holder have a ribbed-base construction which permits many sizes or styles to be used. Logotypes are available in any standard size or style. Type re-inks automatically, and a self-return mechanism restores the printing surface to original position after imprint.

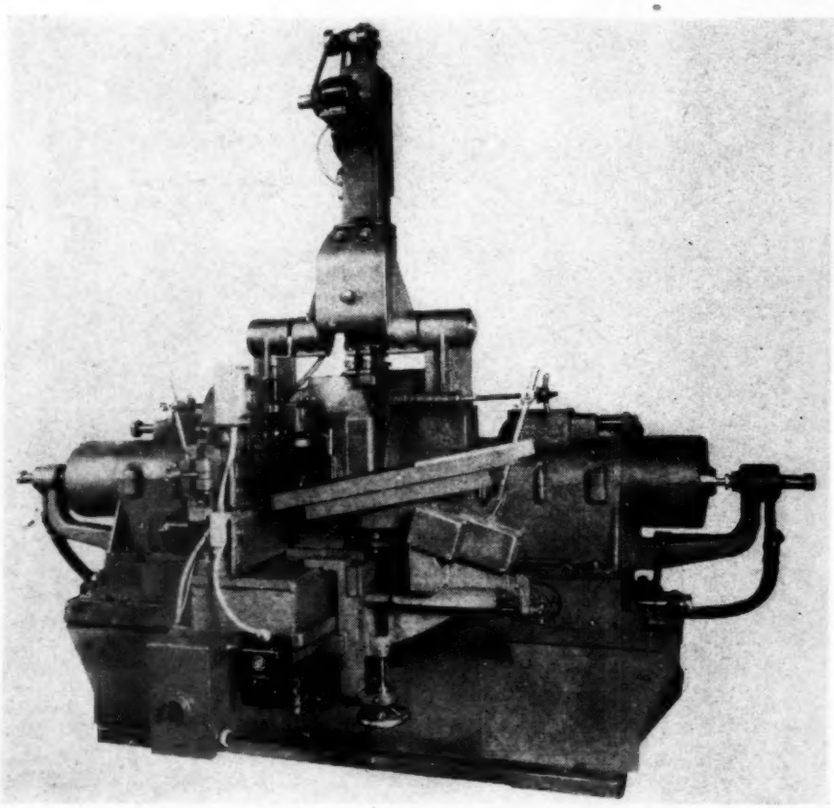
INSPECTION DEVICE—"Airlectric Multicheck," made by Sheffield Corp., Dayton 1, Ohio, inspects and separates 500 to 700 automotive pistons per hr. into eight classifications. Measures average dia. of pin holes, dia. of 4 ring grooves, widths of 5 ring grooves and dia. of bottom skirt. Uses color stamping to segregate. Accuracy is independent of human element, speed depends on efficiency

Sta-Ga-Co Vise and Angle Plate For Drilling, Layout, Grinding



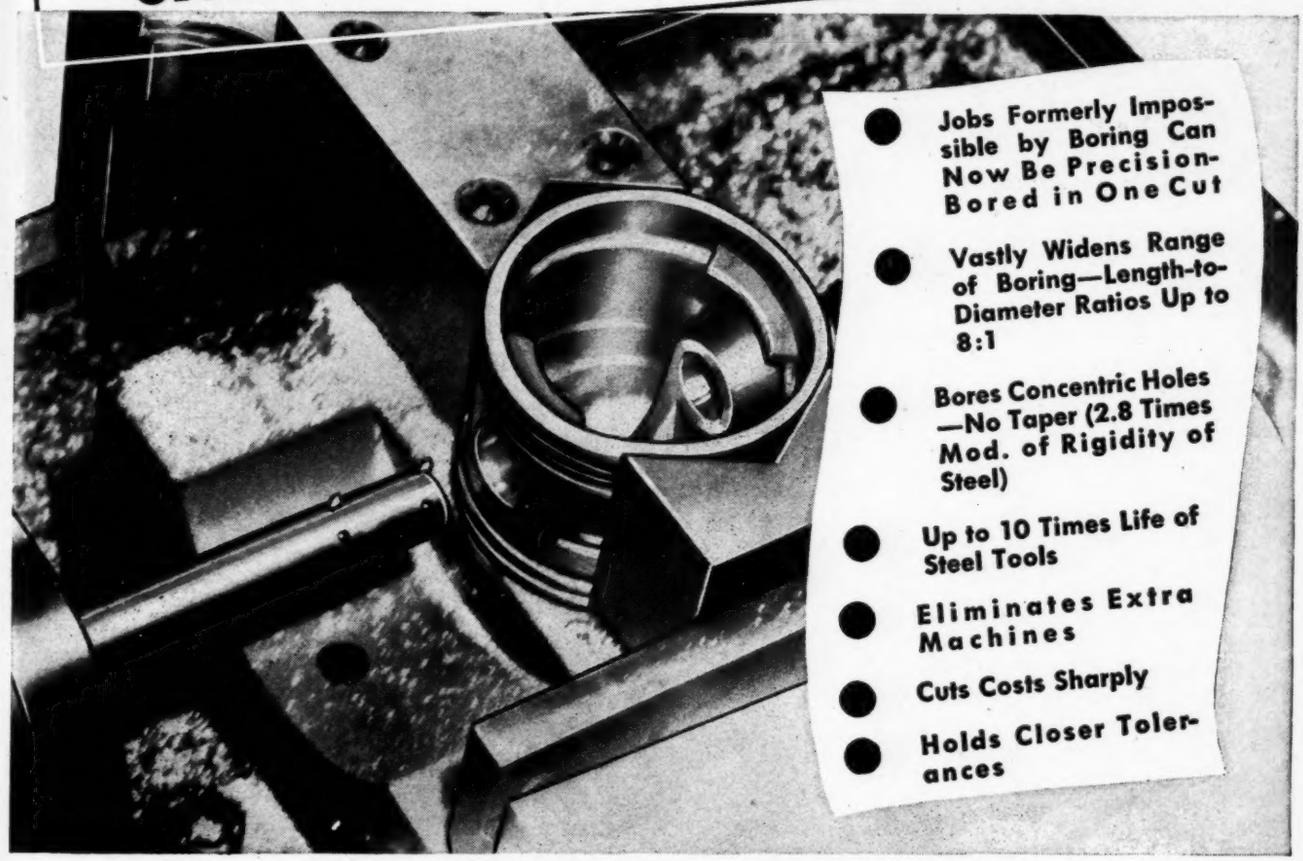
A combination vise and angle plate is made by Star Gauge Co. and distributed by Gale Forssen Co., 64 Monmouth St., Springfield 9, Mass. The unit is designed for such operations as layout work, drilling, tapping, light milling and grinding. The vise mounts at any angle, on end or either side.

The 3½-lb. angle plate is 2½ in. high, 3½ in. long and 3½ in. wide. The vise has 1¾-in. jaw opening, 1-in. deep reversible jaw, is 4-5/16 in. long, 2 in. wide and 2 in. high. It weighs 3½ lb. All dimensions are ground square to within 0.0003 in.



WET GRINDER—No. 226 double-spindle grinder uses oil as coolant. Grinds double-end drop-forged engineers' wrenches and other parts requiring grinding of parallel surfaces. Said to turn out 2400 wrenches per hr. ground on four surfaces, it incorporates magnetic vibrator and automatic chain feed. Wrenches are guided straight through grinder. Made by Charles H. Besley and Co., 118-124 N. Clinton St., Chicago 6, Ill.

New BORING BAR OF SOLID CARBOLOY GIVES YOU THESE 7 ADVANTAGES:


Jobs Formerly Impossible by Boring Can Now Be Precision-Bored in One Cut
Vastly Widens Range of Boring—Length-to-Diameter Ratios Up to 8:1
Bores Concentric Holes —No Taper (2.8 Times Mod. of Rigidity of Steel)
Up to 10 Times Life of Steel Tools
Eliminates Extra Machines
Cuts Costs Sharply
Holds Closer Tolerances

Production doubled, 13-micro inch finish obtained on aluminum piston job.

With this new Carboloy Company development you can do more jobs *by boring*—get precision finishes in one cut—do jobs faster, cheaper. For example:

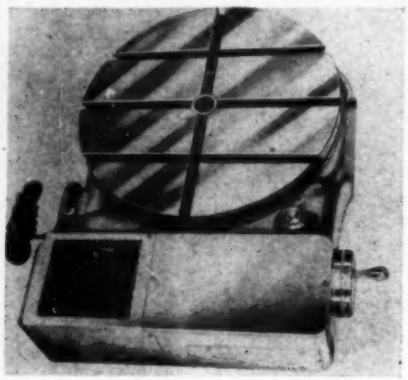
An automobile company, battling poor finish on die-cast aluminum pistons, replaced steel boring bars with the new Solid Carboloy boring bar. New set-up made possible boring completely through piston in one pass (due to 2.8 times greater rigidity of Carboloy)—eliminated need for double-end machine—produced 13-micro inch finish—cut floor-to-floor time—DOUBLED production.

These new solid Carboloy boring bars and tools can produce results like these in *your* plant! Write for free folder, today.

CARBOLOY COMPANY, INC.
11149 E. 8 MILE BLVD. • DETROIT 32, MICH.

CARBOLOY REG. U. S. PAT. OFF. **CEMENTED CARBIDES**

Knight Single-Unit Rotary Table For Milling, Shaping and Boring



A power-feed, single-unit rotary table has been announced by W. B. Knight Machinery Co., 3920 W. Pine Blvd., St. Louis, Mo. Designed to adapt any milling machine, shaper or horizontal boring mill for power rotary milling or precision indexing work, the electrically driven table has no power connection to the machine on which it is used, requires no extra equipment and is said to virtually eliminate set-up time.

There are 18 feed changes from 1½ to 54 ipm., and an optional range from 3 to 108 ipm. is available. Graduations are in minutes and degrees, and a simplified system of changing feed gears is employed. Standard equipment includes three index plates.

The table has 20-in. dia., while the unit is 24¾ in. wide, 30 in. long and 7¼ in. high. Reversible ¼-hp. electric motors for any specified voltage are supplied.

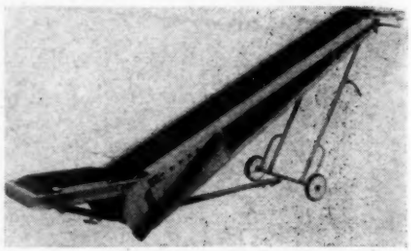
Selas Automatic Brazing Machine Controls Heat, Fuel and Pressure

An automatic brazing machine has been announced by Selas Corp. of America, Philadelphia 34, Pa. Designed for a brass sink fixture, the machine gives automatic control of heat-pattern and heat-time, fuel supply and assembly pressure. It completes the brazing operation in 30 sec., and three stations are provided in a loading, heating and cooling sequence. One station is illlustrated.

Five component parts with preplaced alloy rings are fluxed and positioned in a supporting jig. Air pressure assures close contact, and a solenoid valve opens the gas-air mixture when burners are brought to position. The timer releases burners at the end of the cycle, and they retract, holding pilot condition.

Arrow Products Belt Conveyor Takes 600-lb. Distributed Load

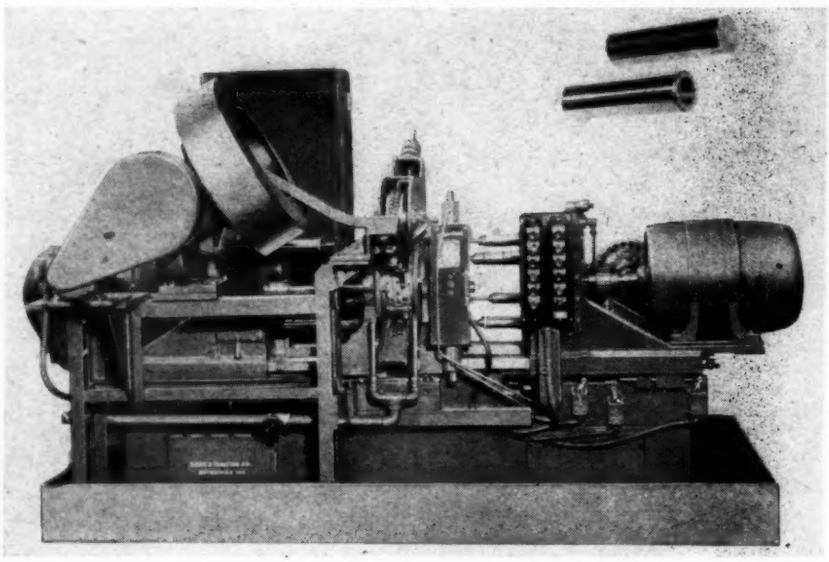
The Ele-Veyor, a lightweight, portable power belt conveyor is made by Arrow Products, Inc., 343 Indiana Ave., N. W., Grand Rapids, Mich. Depending on belt used, it can handle packaged or bulk material, small parts or hot forgings, allowing them to cool on the belt. The



unit can be used as a stacker or as a booster in a gravity conveyor line, reaching 10 ft. height or more.

Available in 6- or 8-ft. length, with 8- or 12-in. belt width respectively, both models take 300- to 600-lb. distributed load, depending on motor hp. Belt speed is from 40 to 50 fpm. and is varied by an adjustable-pitch motor sheave. The drive unit contains reduction shafts and standard frame motor and is known as Auto Tension Drive.

Davis & Thompson Automatic Unit Drills, Reams, Ejects Wrist Pins



Workpieces for the HI-12 are automatically hopper fed and held by direct chain clamping. All functions of the machine are automatic

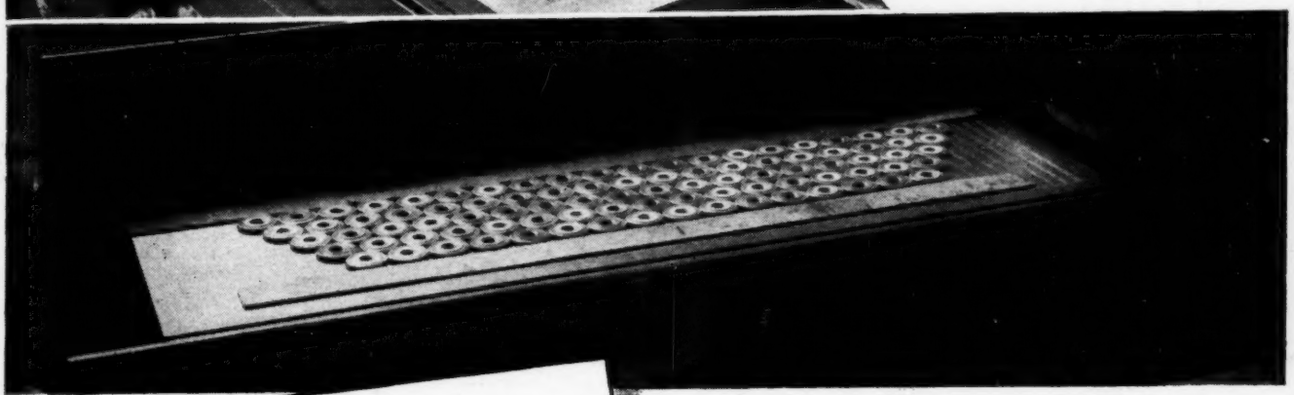
The HI-12 automatic horizontal drilling and reaming machine has been developed by Davis & Thompson Co., 6411 W. Burnham St., Milwaukee 14, Wis. Primarily designed for operations on wrist pins, the machine can be adapted to similar work.

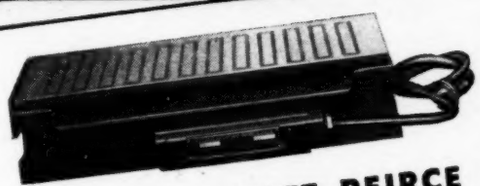
Two opposed drilling heads are mounted on a common bed, and power is supplied by two 7½-hp. motors. Horizontal movement on the ways is accomplished through a single hydraulic cylinder by means of rack-and-pinion drive. Production is 300 pieces per hr.

The hydraulic indexing fixture has six stations. Station 1: parts loaded; station 2: 15/32-in. hole drilled 1-3/64 in. deep in each end; station 3: 7/16-in. hole drilled completely through; station 4: end holes enlarged to 19/32 in.; station 5: end holes reamed to 0.600 in., ½ in. deep; station 6: eject.

ONE MASSIVE CASTING

OR A LOAD OF SMALL PARTS





There's a TAFT-PEIRCE SUPERPOWER MAGNETIC CHUCK to Hold Every Type of Work

Size for size, the Taft-Peirce Superpower exerts more holding power, over a greater magnetic working surface. Magnetic flux is concentrated heavily at the face-plate, permitting a wider range of setup.

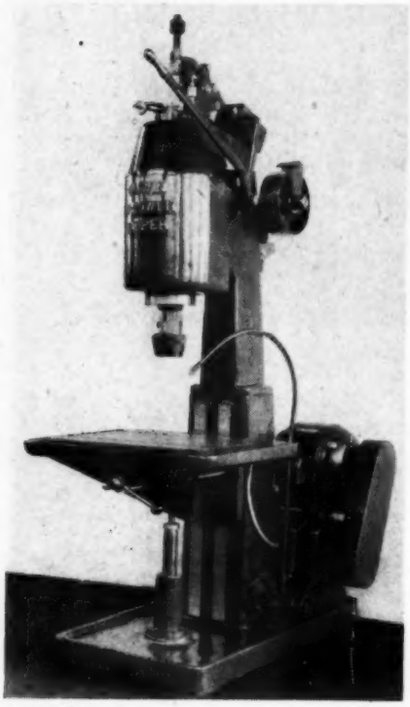
Every Taft-Peirce Superpower Chuck is built with an all-steel body — with all electrical components permanently sealed against moisture, shock, and electrical damage. You can get these finest of all magnetic chucks in rectangular, rotary, or vertical face models — with duplex, swivel, or taper base — with fine-mesh face-plates for small work—and with complete Superpower control switch equipment.

Check up on Superpower's power to save on your own machines — not only on grinders, but also on planers, millers, lathes, shapers — and *non-machine* applications, too. Write for new Superpower Bulletin A-Z. The Taft-Peirce Mfg. Co., Woonsocket, R. I.

THE TAFT-PEIRCE MFG. COMPANY

WOONSOCKET, RHODE ISLAND

Garvin Hi-Power Tapping Machine Takes 3-in. Tap in Cast Iron



Involute integral splines are provided on all sliding gear shafts and spindle of the Garvin tapper

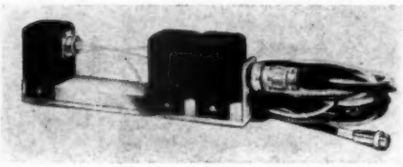
The Garvin Hi-Power tapper has been announced by Western Machine Tool Works, Holland, Mich. With a heavy-duty capacity for a 3-in. tap in cast iron, the machine retains the automatic-operation feature of the other Garvin tappers. The operating lever is pulled down, the tap enters pre-drilled hole, taps to required depth, reverses and backs out to original setting at higher speed.

Spindle rotation is obtained through oppositely rotating friction clutches of different diameter which provide the fast backing out of the tap. The clutches are adjustable for wear and torque-transmitting capacity. Torque is supplied by driving pulleys mounted on Timken tapered roller bearings. The spindle takes a heavy-duty, self-centering chuck, either an adjustable type up to 1¼-in. shank dia., or non-adjustable collet type. A tripping device actuated from stop nuts on the spindle, which are lockable in any selected position, provides accurate tapping depth.

A selective-type speed box provides four standard spindle speeds of 64, 86, 124 and 167 rpm. A self-contained unit, the box has an individual motor on a hinged plate for V-belt adjustment. 5-hp. 1800-rpm. motors are supplied as standard on demand with starter and pushbutton controls.

The table is actuated by means of telescopic screw and stationary nut. An adjustable positive-displacement pump, driven from the gearbox, delivers coolant and lubricant to the tap. All transmission shafts and the splined spindle are mounted on Timken tapered roller bearings.

Potter Photoelectric Actuator Detects 30,000 Shapes per Min.

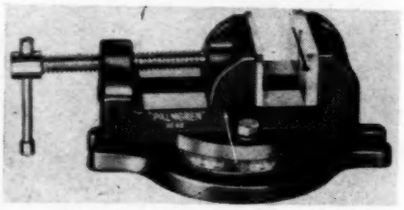


The Model 600 photoelectric actuator has been developed by Potter Instrument Co., 136-56 Roosevelt Ave., Flushing, N. Y. The unit detects small, lightweight or irregular shapes at rates up to 30,000 per min.

The beam is 1/16 in. wide and responds to changes in light level as small as 20%, and, as complete interruption of light is not required, objects as small as 0.010 in. can be counted. A capacitor-discharge output circuit for operation of control solenoids such as are used for deflector gates and packaging is included.

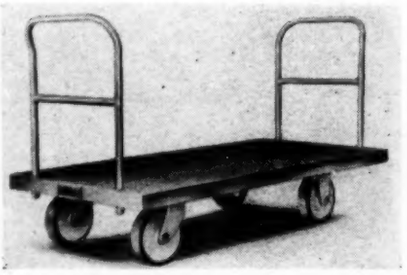
Electronic counters of various capacities, output circuits and predetermining features can be supplied for the actuator.

Palmgren Milling-Machine Vise Swivels on Base Graduated 360°

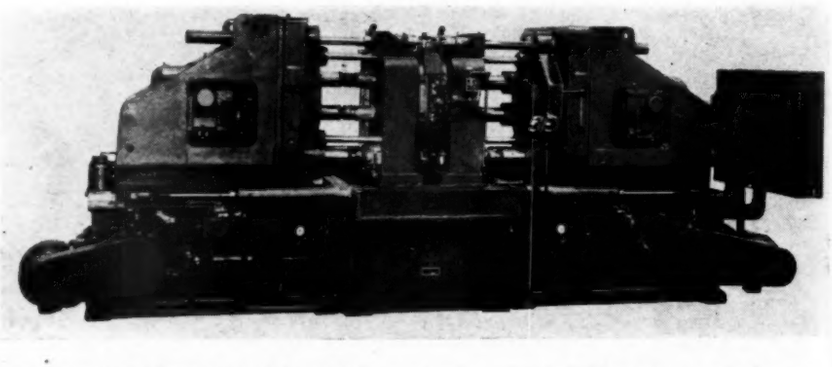


A Palmgren milling-machine vise with a swivel base has been announced by Chicago Tool and Engineering Co., 8354 S. Chicago Ave., Chicago 17, Ill. Known as No. 410, the vise affords set-ups at any radius within 360°. The graduated base locks into position when set.

The 4-in. jaws open 4 in., and one is grooved horizontally and vertically for holding round pieces. Jaw depth is 1¾ in., weight is 21 lb., and overall height is 4⅝ in.

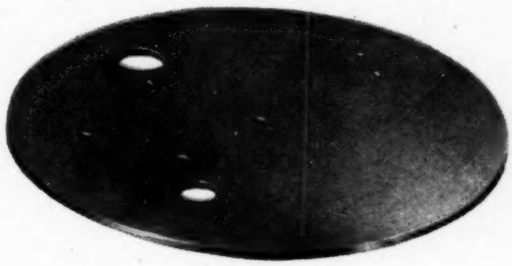


HAND TRUCK—All-aluminum trailer weighs 175 lb., has 2000-lb. capacity. Standard platform is 3x6 ft. and 14½ in. high. Platform size can be varied. Wheels are 10x2½-in. Made by Mercury Mfg. Co., 4114 S. Halsted St., Chicago 9, Ill.



SPECIAL MACHINE—Model 30 HH two-way opposed floor-type unit for operations on steering-knuckle pin, upper arm support. Made by Baker Brothers, Inc., Post & W. Lake Sts., Toledo 10, Ohio. Each unit has 4-spindle, fixed-center multiple head for hollow milling and chamfering. Heads have two additional drivers for operating lead-screw spindles for external threading. Two pieces loaded at first of four stations on hand-indexed trunnion. Station 2, ends chamfered; 3, O.D. turned; 4, parts threaded. Parts unloaded at station 1

UNUSUAL METHOD OF FLANGE FORMATION



Step 1.

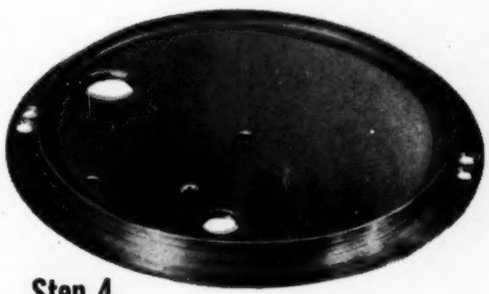
Discs are cut from brass squares, and holes punched for the fittings.

Step 2.

A slot is machined in the edge of the disc. Cutting tool is so designed that it deforms the metal on one side of the slot.

Step 3.

The deformed edge is rolled up to an angle of 90° with the disc.



Step 4.

The flange is machined down to the proper height, which automatically removes the slight puckers that appeared on the edge during the previous operation. Top is subsequently polished and nickel plated.

...A CASE HISTORY BY REVERE

THIS interesting method of producing an integral flange was originated by the Empire Milking Machine Co., West Chester, Pa. The part is a top for its milking machine pail... Revere takes pride in its collaboration on the project. The combination of cutting and deformation required special qualities in the metal; Revere recommended Cartridge Brass, Alloy No. 161, and specified the temper. The proper tool angles were worked out with the customer, and the third operation was changed from spinning to rolling. Thus rejects were reduced to practically zero, and manufacturing time and costs were lessened... If you have a problem in metal selection and fabrication, Revere will gladly place it in the hands of its Technical Advisory Service.

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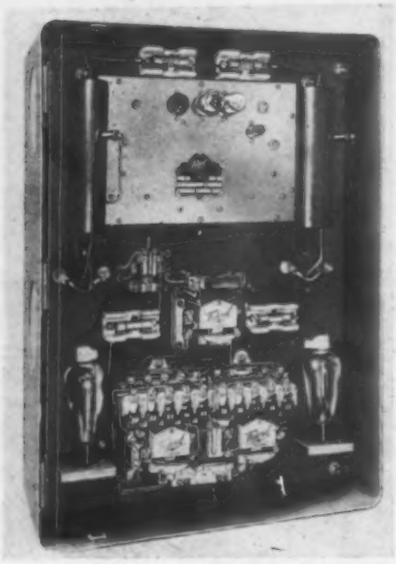
Parts and Materials

Federal Electric Motor Control Runs dc. Motors from ac. Power



An electronic motor control, the Noark, for operating dc. motors from ac. power is made by Federal Electric Products Co., Newark, N. J. It is available in two models: one is a general-purpose reversing type applied to a 2-hp. 220-v. dc. motor, and the other is a special control for an Abrasive M-3 surface grinder.

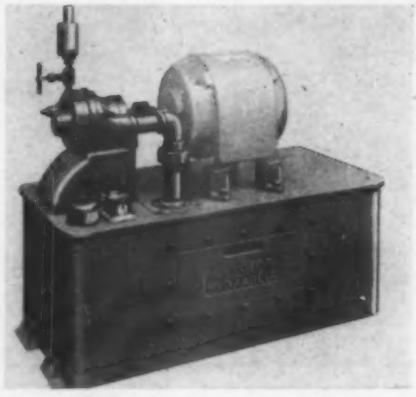
The control is said to provide an almost flat speed-torque curve with changes in load having little effect on speed. For any speed setting, performance is said to be practically equal to that of a synchronous motor, even with suddenly applied loads. Electronic circuits limit the current to preset value regardless of load, providing stepless acceleration from standstill without drawing excessive current from the line. The current-limiting feature protects motor and control in case of overload, and also serves to limit torque.

Starrett Ground Flat Stock Held to 0.001-in. Tolerance

Two types of precision-ground flat stock are announced by The L. S. Starrett Co., Athol, Mass. The oil-hardening type is a non-deforming, electric-furnace tool steel. It is fully spheroidize-annealed for precision parts requiring accuracy of size after hardening. The water-hardening type is a high-grade tool steel annealed for easy machining. It develops maximum hardness when quenched in water or brine.

The stock is designed for applications such as die parts, flat gages, templets and other parts with two parallel surfaces. It comes 18 in. long, ½ to 6 in. wide and 1/64 to 1 in. thick. Each piece is marked for size and type, is protected by an envelope with instructions indicated, and is held to 0.001-in. tolerance on the flat sides.

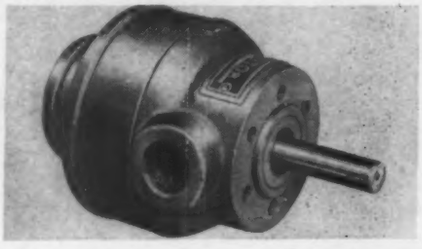
Gerotor May Hydraulic Units Can Deliver Oil at 1000 psi.



Standard or special motors can be mounted on the hydraulic pump units

Hydraulic pump units embodying various sizes of Gerotor hydraulic pumps and designed to deliver steady oil flow at pressures up to 1000 psi. are announced by Gerotor May Corp., Maryland Ave. & Oliver St., Baltimore 3, Md. Each unit includes dustproof tank; combination filler, screen and breather cap; oil-level indicator, pressure gage and gage shut-off valve; adjustable relief valve, flexible coupling and all piping.

The single-pump units (Series 9100) have six tank capacities from 4½ to 100 gal. and operate at 1200 or 1800 rpm. Double-pump units for two separate circuits (Series 9200) have five capacities from 10 to 100 gal. and operate at 1200 rpm.



Gear mechanism is in a stronger body in the QH series pump than in the prior models

Another development is the QH series pump designed for intermittent operating pressures to 1500 psi. or continuous pressures to 1200 psi. The QH has capacities of 3, 5, 8 and 12 gpm. It can be plain, base or flange mounted.

Servell's Masking Liquid Peels Off in Large Sheets

Plask, a masking liquid, has been developed by The Servwell Products Co., Inc., 6523 Euclid Ave., Cleveland 3, Ohio. A plastic paint-spray protector, it is applied with a brush like paint, dries in less than 5 min., and peels off in large sheets. Waterproof and airproof, Plask is recommended for glass and all types of unfinished, plated, or finished non-porous metal surfaces, including baked synthetic enamel. One thin coat is required, and one gal. spreads about 200 sq. ft.

Westinghouse DH-MO Electrode Welds Cast or Rolled Steels

The DH-MO electrode for welding low-alloy cast steel or low-alloy high-tensile-strength rolled steels in the flat position is announced by Westinghouse Electric Corp., Box 868, Pittsburgh 30, Pa. Used with ac. or dc. straight polarity, available in four sizes from 5/32- to 1/4-in. dia., it welds grooved joints, and positioned and horizontal fillets.

J&L ELECTRICWELD STEEL TUBING IS AVAILABLE TO YOU NOW

Manufacturers are taking advantage of the fact that J&L Electricweld Tubing is now available for early delivery. Design and production engineers know that the great strength of this light tubular section permits reduction in weight and bulk with saving in costs of material. It also can be fabricated economically.

For forming operations, the uniformity of cross-section and wall thickness of Electricweld Tubing makes it possible for products to conform to close tolerance limits. Electricweld Tubing can be altered in cross-section by any number of processes to meet requirements of design. It bends easily in all directions and can be readily joined by mechanical or welding methods.

Beauty and sales appeal in finished products are aided by the smooth, uniform surface of J&L Electricweld Tubing. It provides an ideal base for electro-plating, enameling, and painting. These finishes can be applied with a minimum of surface preparation.

For information on delivery of J&L Electricweld Tubing to increase your production and improve your products, contact the nearest sales office listed below.

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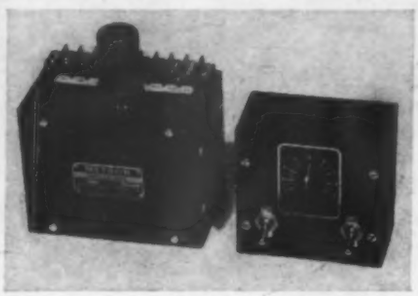
Spiralok Variable-Pitch Pulley Will Drive in Either Direction

The Spiralok fixed, adjustable, variable-pitch V-belt pulley is announced by Scientiae Corp., 103 Pine St., Dayton 3, Ohio. A spiral wedging action locks the pulley in rigid alignment with the shaft, using no setscrews and requiring no threads or keyways. It will drive in either direction, and an infinite number of adjustments may be made. It is adapted to motor-driven, V-belt-connected apparatus of all kinds.

Electric Products Section Panel Controls Charging of Batteries

A sectionalized control panel for battery charging has been developed by The Electric Products Co., 1725 Clarkstone Rd., Cleveland 12, Ohio. The panel is fastened to the wall by means of two angle-iron brackets. Each section comprises a complete charging circuit with totally enclosed controls on the front of the board. Visual control of charging is provided by an indicating lamp on each section. The panel is 76 in. high. Each section is 9 in. wide and can be added to the panel by securing a few bolts, extending the main power bus with a jumper and lengthening the control wires.

Small Metron Electronic Timer Employs One Tube, Two Relays



Small welding and industrial electronic timers are announced by Metron Instrument Co., 432 Lincoln St., Denver 9, Colo. The 4x4x2-in. control box can be mounted or incorporated in the machine or screwed to the timer box to make an integral unit.

Intervals from 1/60 sec. to several minutes can be provided in one or several continuously variable ranges. Adjustability by steps or fixed-interval timers are available. Timing accuracy is said to be substantially unaffected by variations in line voltage or temperature. One tube and two relays are employed.

L & R General-Purpose Motor Supplied with 3-Step Pulley

A general-purpose universal motor has been developed by L & R Mfg. Co., 577 Elm St., Arlington, N. J. Mounted on a pedestal, the unit is supplied with a three-step pulley, foot rheostat and reversing switch.

The spindle has a ⅝-in. shaft extending in both directions. The motor is rated 1/10 hp. at 5000 rpm., ac. or dc. and has a 3¼-in. O.D.

Bristol Oil Hydraulic Cylinder Takes Nine Standard Mountings

A 1500 psi. oil hydraulic cylinder has been announced by Bristol Machine Tool Co., 913 Wood St., Bristol, Pa. For machine-tool applications, the cylinder is designed so that, by the use of simple attachments, nine standard mountings can be had from the same basic cylinder.

A built-in self-adjusting cushion is in each end, and automotive piston rings combined with "O" rings are employed to prevent leakage between cylinder chambers.

Greer Hydraulics Power Pack Supplies Power to Presses

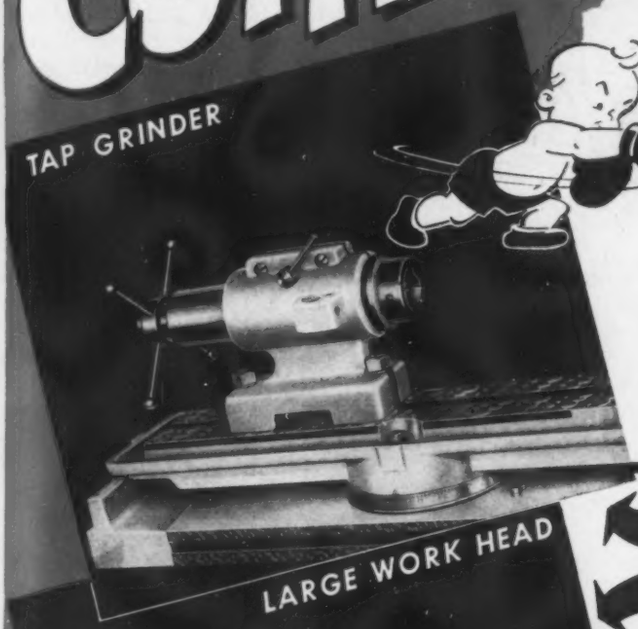
The Model CBP-1, a hydraulic power pack, has been added to the line of Greer Hydraulics, Inc., 454 18th St., Brooklyn [illegible], N. Y. The unit is self-contained and can be used to supply large volumes of fluid under controlled pressure to presses or similar machines using hydraulic fluid for power.

A small electric motor and pump are employed to store fluid under pressure in a 10-gal. storage chamber. Fluid is released instantly and supplied to the press during the work cycle, returning to the reservoir at the end of cycle. The machine is designed to eliminate the need for large motors and hydraulic pumps in intermittent-duty cycles.

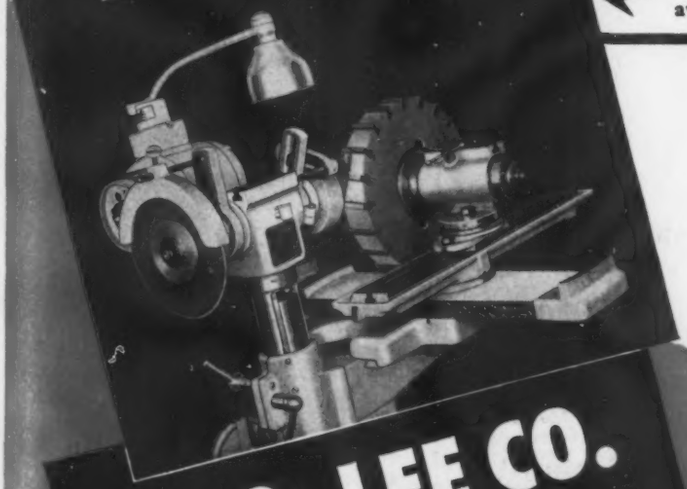
FOR EASIER, FASTER, BETTER CUTTER GRINDING

USE "KNOCK-OUT" KO FIXTURES

TAP GRINDER



LARGE WORK HEAD



. . . more production per MAN HOUR with BETTER GROUND TOOLS!

Industrialists and labor leaders—economists and politicians—YOU and I agree that we need more production at lower cost. YOU can get more production per man hour with better ground tools—tools sharpened on "Knock-Out" cutter grinder fixtures designed to do a better job faster and easier.

Sturdy, compact tap grinding fixture accommodates taps from No. 8 to 2½", 2 to 6 flute. It is adaptable to any make of tool grinder.

This large sensitive ball-bearing workhead is fully universal and may be used on any make of tool grinder. Various collets, straight sleeves and taper sleeves are available.

The "Knock-Out" Tap Grinding Fixture (above) handles all taps from No. 8 to 2½"—grinds chamfer and flute—reconditions broken taps. You get more pieces per grind and more grinds per tap! With the "Knock-Out" Sensitive Work Head (right) it's easy to grind tools from keyway cutters to 12" mills. Set-ups are simple and fast—grinding is accurate—tools produce more pieces. These, and many other "Knock-Out" cutter grinding fixtures, will help you obtain better sharpened tools that will increase production per man hour.

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THE SOLID SHIM THAT peels FOR ADJUSTMENT

2218

ROUND TABLE Discussion

SHOULD A MAN OWN HIS OWN TOOLS?

It is the custom in some works for all precision-measuring tools to be returned to Stores at the week-end for safe custody. To get these reissued on Monday mornings takes time and causes delay. The risk is too good to be discarded, however, as the following experience will show.

The writer had just taken over control of a plant. During the first few days, an order for several new micrometers as replacements was put forward for signature. Not satisfied with this, I asked for the following information: a. the number purchased in the previous year; b. the number in the past five years; c. the number condemned as worn out in the previous five years; d. the existing stock.

Through this questionnaire it was disclosed that although none were condemned, the number available for use was about half the quantity purchased and issued. The others had been "lost in shop"; a less pretty term for "stolen." All tools were marked with the firm's monogram, but its removal would take but a few minutes. This may have been an isolated case, but a check of this kind might prove worthwhile in other works.

While I think it is the firm's duty to provide instruments of precision, the workman who has his own is often in the better position. If he is worth employing, he should be relied upon to take good care of all tools irrespective of ownership.

J. E. Powell
Lincoln, England

•

WHEEDLER OR NEEDLER?

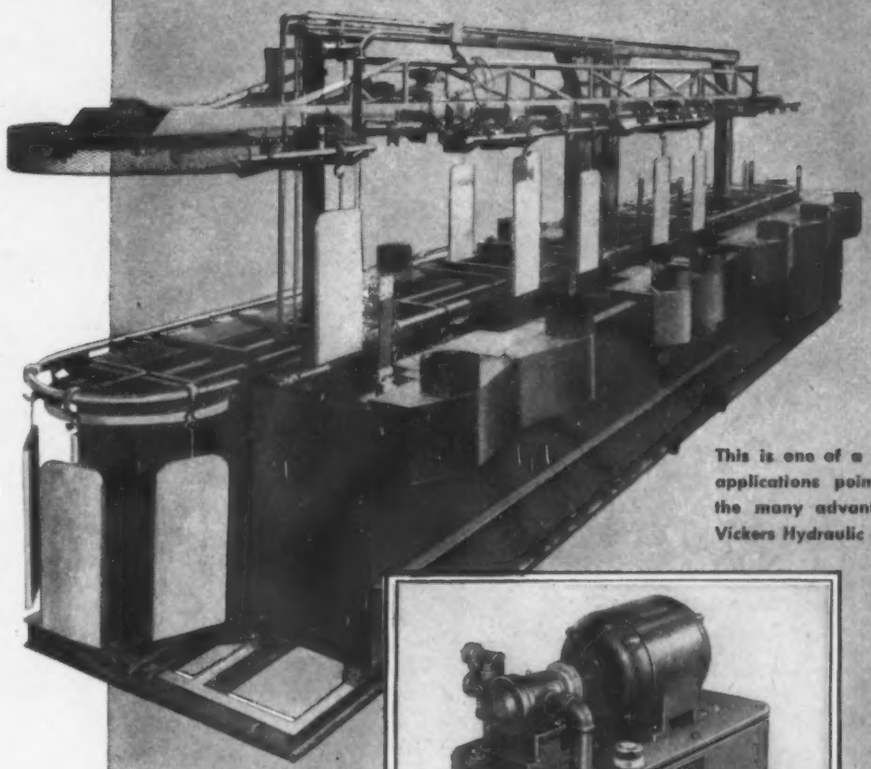
An average man, by using his natural talents when made a foreman, can get good results for a limited time. But as soon as the men get thoroughly acquainted with his weak points they will take advantage of them. Then production and quality will begin to go down.

A few fundamentals should never be overlooked in choosing those who are to supervise. A friendly approach in both manner and speech will make the workmen feel that although they may be subordinates of the foreman, as men they are on

VICKERS helps achieve HYDRAULIC EQUIPMENT

HIGH PRODUCTION
SPACE ECONOMY
UNIFORM QUALITY

IN *Udylite* AUTOMATIC PLATING MACHINE



This is one of a series of applications pointing out the many advantages of Vickers Hydraulic Controls.

Above: Elevated position for transfer from one tank to the next.

Vickers Hydraulic Power Unit.

This Udylite machine does a complete plating job automatically . . . taking each part through seven tanks and a drying chamber . . . timing exactly the interval in the various solutions for cleaning, plating and rinsing.

Each part (or rack of parts) is automatically lowered into each of the seven tanks in turn—then lifted out and transferred to the next tank. This might be done with a multiple dip conveyor. But the conveyor slants permissible in lowering and raising in that way require extra tank length.

Udylite made the machine far more compact—saving 18" to 24" in the length of each tank—by using Vickers Hydraulic Equipment to raise and lower the entire conveyor assembly at each transfer. By this means, each piece (or rack) is lifted straight out of the tank, moved over the next tank and lowered straight down. This provides better cleaning and more uniform plating—better drainage and less contamination of the solutions.

The Vickers Hydraulic Power Unit and Control Valves have many advantages for such applications: (1) proven dependability, (2) accurate control and precise timing, (3) flexibility of control to suit varied production requirements, etc.

The versatile features of Vickers Hydraulic Equipment on this type of application, as on many other industrial installations, have made possible increased production, improved product quality, greater safety, and lessened physical demands upon labor while increasing its productivity. Vickers Application Engineers will gladly discuss your individual control problems.

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New BULLETIN

Write for Bulletin 46-43 describing Vickers Hydraulic Power Units.

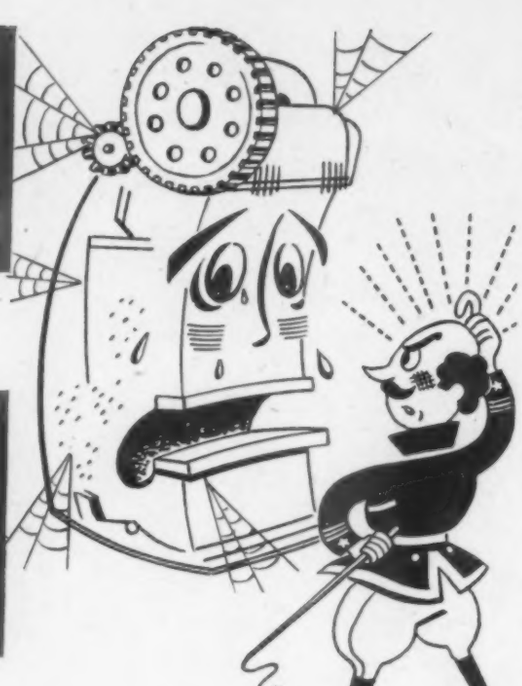
ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

BEATTY No. 14 Toggle Punch for structural steel fabrication.

BEATTY No. 11-B Heavy Duty Punch extensively used in railroad industry.

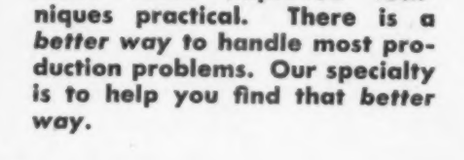
BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.

BEATTY 250-ton Gap Type Press for forming, bending, flanging, pressing.



You can't teach an OLD dog NEW tricks!

Any basic improvement in your production technique will usually call for custom-built equipment — designed to do a specific job in a *better, faster,* more *economical* way. Our experience in many fields qualifies us both to help you work out that better production technique and to design and build heavy metal working equipment that will make those improved techniques practical. There is a *better way* to handle most production problems. Our specialty is to help you find that *better way.*



HYDRAULIC HEAVY METAL WORKING EQUIPMENT

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

the same plane and entitled to the same courtesy. They expect to be given orders, but if they are *commanded,* it doesn't set so well.

Another fundamental is that the foreman knows thoroughly the work he is directing, even to the extent of performing the operations himself in the way prescribed, so he doesn't ask anyone to go beyond what he could do himself in amount or quality. This applies only in a general way, as on very long runs an operator becomes so familiar with the work that no one without his long and special experience and practice could equal his performance.

Another fundamental is patience, still another firmness in having instructions followed. A foreman should be able to make his explanations clear. He should not have what is sometimes termed "a gift of gab." While such a gift can (and sometimes does) give him a start, it is soon recognized at its true worth—and doesn't get the user very far.

Both praise and criticism are advisable at times where needed to bring best results. However, both should be given to the deserving individual without attracting the attention of others.

Martin H. Ball
Watervliet, N. Y.

•

"Wheedler or Needler?" puts neatly into two words the question that must have faced expediters ever since they came into being.

"Expediters," "coordinators," "production engineers," and "chasers" are some of the printable names given those poor unfortunates who are theoretically charged with the responsibility of getting the job out "as soon as possible." From experience, it seems that in many plants schedules are set up either from sales forecasts to be run seasonally, or from combinations of cyclical economical shop runs and customer requirements, and then actually turned out as though they were the divinations of a crystal gazer.

As an example: In a large plant engaged in the manufacture of agricultural implements, schedules are carefully set to follow plowing, planting, cultivating and harvesting seasons throughout the world. Each year, after approval, they are passed to the shops involved. Expediters are each given one or more machines, depending on complexity, and directed to follow from foundry, punch, shears and lumber yard through forge, machine-shop, sheet-

YALE FORK TRUCK

DEPENDABLE POWER

CUT MATERIALS HANDLING COSTS
MOVE MORE GOODS WITH SAFETY

You can do both... and *MORE*... when you use EXIDE-IRONCLAD POWERED Electric Trucks

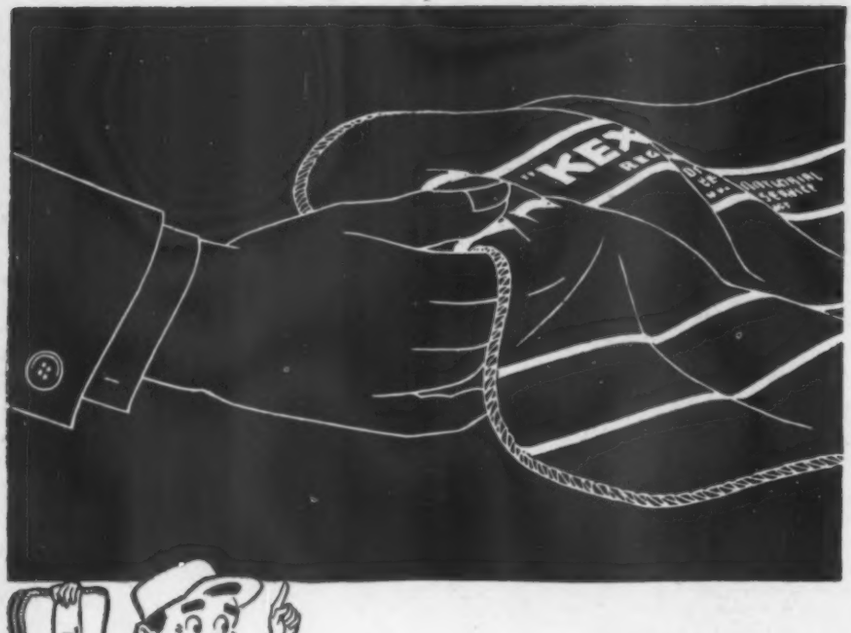
Wherever goods are lifted, hauled and stacked, efficient battery electric trucks and Exide-Ironclad power are effecting important economies all along the line. They do more work per man per hour and at less cost. They do it with greater ease and safety. And they maintain a steady pace straight through to the end of every shift.

Exide-Ironclad Batteries have the high power ability, the high maintained voltage and the high capacity that materials handling demands. You can always count on Exide-Ironclad Batteries for dependability, long-life and ease of maintenance.

Write us for a FREE copy of Exide-Ironclad Topics which contains "Case Studies" of materials handling problems. It tells how to cut handling costs up to 50% . . . covers latest developments in handling materials from receiving to shipping.

YALE WORKSAVER

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 32
Exide Batteries of Canada, Limited, Toronto



You even know "KEX"
WIPING TOWEL QUALITY
...in the dark!

THAT SMOOTH SOFTNESS . . . you can even tell in the dark . . . is the reason why you can use KEX Wiping Towels on the most delicate surfaces . . . without a worry. There isn't a hard seam . . . not a button . . . or a particle of hidden abrasive dirt . . . to scratch or mar the finest, most sensitive of precision instruments.

KEX Wiping Towels are uniform in size . . . big and tough enough for any wiping job . . . and usable right to the very edge. They are manufactured for the very purpose for which you will use them and are not cast-offs that have served other purposes. KEX Wiping Towels are always on hand when you need them . . . delivered on a regular schedule to fit your requirements. And *clean! They're absolutely clean* . . . made that way by a special, high heat process.

RENT KEX WIPING TOWELS AND SAVE MONEY!

Nothing to buy—no expensive inventory—just a low monthly rental. The very first month that you rent KEX Wiping Towels should show an appreciable saving on wiping costs.

For complete information, see classified section of your Telephone Directory for nearest KEX distributor, or write
KEX National Service, 295 Fifth Avenue,
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"KEX"
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NATIONAL SERVICE
A CALLAWAY MILLS PRODUCT
INDUSTRIAL WIPING CLOTHS

metal, sub-assembly, paint and final assembly to domestic and export packing. Complications are added because each country and some domestic territories take different versions of the same machine. A new man follows the schedule, deferring to the other fellow as it says in the rules. This lasts one week, maybe two—then one morning he throws all other programs but his own in the basket and starts to go to work. He wheedles! He needles! He soft-soaps! He remembers the adage, "The squeaking wheel gets the grease."

There are other companies where individual production men are employed for different classes of material in the same plant. They schedule—even make written promises to customers day after day. Just as though a general superintendent, five superintendents, two vice-presidents and the sales manager weren't wandering through the plant pushing their own pet jobs. Now I ask—Wheedler or Needler?"

Lest this discourage the younger generation from ever entering such a position, it should be added that there are shops where a production schedule is law. Everyone obeys it and only an expediter can alter it—which he does if an emergency arises. That's all he's there for—to foresee or forestall any breakdown and effect changes necessary. In such shops—many and successful, there is little reason to wheedle or needle.

A. M. Elliott
LeRoy, N. Y.

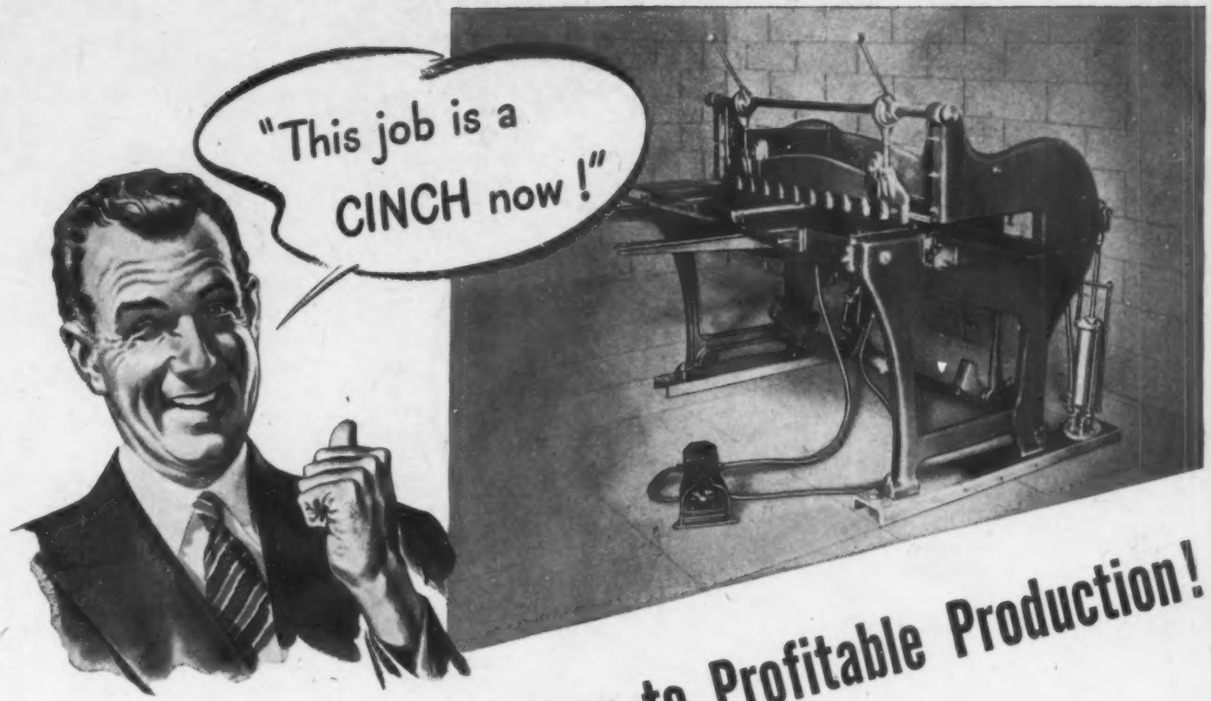
•

WHO PAYS FOR BREAKAGE?

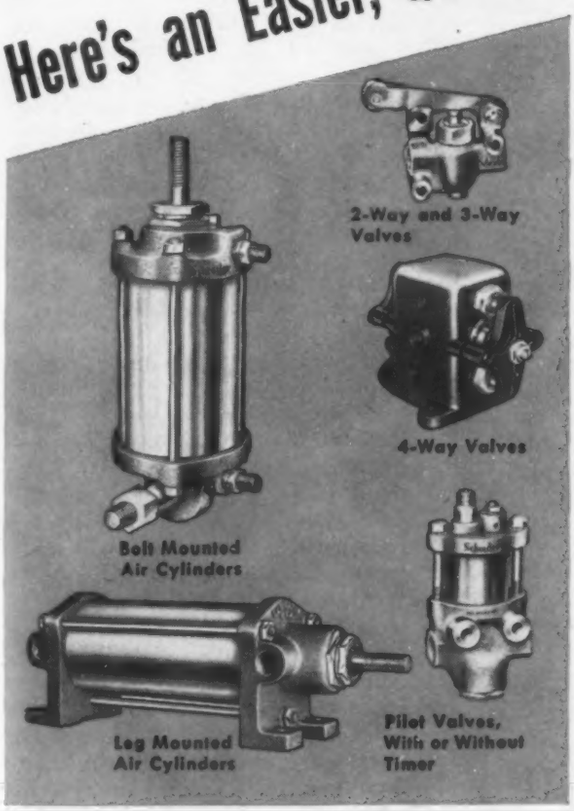
To me, the idea of billing a company for tools broken or worn through use on company work, whether careless use or not, is something new. The only experience I ever encountered similar to this was while working for a large aircraft-engine manufacturing firm in Hartford, Conn. This company permitted the inspection department to check and clean measuring tools owned by employees.

I asked fellow employees what they thought of this idea and what has happened to them in cases of tools used and broken on the job. As for tools broken through the fault of the employee, invariably they could not see asking the employer to pay for this personal-property loss.

In our shop, one man had an adjustable wrench of his own stolen from his box. Upon being reported, it was replaced immediately. Another man, employed by a machine-build-



Here's an Easier, Quicker Answer to Profitable Production!


2-Way and 3-Way Valves
4-Way Valves
Bolt Mounted Air Cylinders
Leg Mounted Air Cylinders
Pilot Valves, With or Without Timer

Can you improve production and safety of manufacturing operations quickly and easily without expensive alterations to plant or machinery?

Yes! By using compressed air, efficiently controlled by Schrader Valves and Air Cylinders, to operate your machines. Take this shearing machine for instance: by converting to air control, production is boosted, operator fatigue eliminated, and there is far greater ease and versatility of operation. Not only that but with air power you can frequently shear heavier gauge metal. This is a typical illustration of what Schrader Valves and Cylinders can do when put to work on shearing machines, power presses, welding machines, kick presses, arbor presses and many other essential machines.

Consider Schrader Valves and Cylinders as production boosters in your plant. Installation can often be made with little or no extra load in your present compressor capacity.

Schrader Air Cylinders and Valves give you efficient control of compressed air. Help you accomplish more—in less time—with less manpower used.

For further information on how these Schrader products can help you, write today to Department 3

EVERYTHING FOR EFFICIENT AIR CONTROL

Air Cylinders, Operating Valves 2, 3 and 4-way (hand, foot and remote control), Press Operating Controls, Pneumatic Machine Controls (all types), Air Ejection (Knockout) Sets, Quick Acting Couplers, Blow Guns, Air Hose and Fittings, Hydraulic Gauges.

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Division of Scovill Manufacturing Company, Incorporated

Schrader
PRODUCTS
CONTROL THE AIR

Are You 'too' losing tools this way?

A 13-year employe and chief shop steward at the [redacted] main plant in [redacted] admitted today he had eluded plant guards for five years and stolen enough tools and equipment to fill two trucks—but he didn't know why.

The loot was valued at $5,000, [redacted] spokesmen said.

HIDDEN BY COAT

"I got to carrying things home under my coat," he told a reporter, "You know they do that in all the plants.

"I guess I just kept it up and finally, when they were tearing down a cooling tower, I drove in my trailer to haul off some scrap lumber and I hid the stuff underneath the load."

The "stuff" included four big electric motors, four switch boxes and tools ranging from screw-drivers to electric drills, police said.

[redacted] denied having disposed of any. The articles were recovered at his home.

Everyone recognizes the fact that tools disappear this way, when antiquated checking systems are used. Do you realize how much these losses amount to every year *in your own plant?*

Unless you have complete control of the tools in your cribs you cannot know. You can be sure, though, that such hidden losses are adding many dollars to your costs.

McCaskey Tool Control will stop them by making each employee 100% responsible for every tool loaned to him—by accounting for all of your tools all the time whether in or out of the crib—by reducing tool inventories—by cutting breakage—by locating and preventing numerous "hidden losses."

Why not make it impossible for an employee in your plant to say, "You know they do that in all the plants"? Investigate and adopt McCaskey Tool Control now!

Whether you have one or several cribs for production or maintenance work, McCaskey Control will cut your tool costs and prevent production delays. Write for reports of cost-reduction and improved operations in several well-known plants.

McCaskey INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • TOOLS • COSTS • PAYROLL

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Canada The McCaskey Register Co., Watford, England

ing firm, had his own expensive pair of safety goggles broken by a flying piece of grinding wheel; only with difficulty was the company persuaded to pay $25 of the $30 the goggles cost. To them the idea was unacceptable.

It is obvious from accounts of policies as practiced by different industrial concerns that compensation for wear of personal tools is acceptable, at least in part. Some already replace personal work clothes such as overalls and aprons where damaged by contact with company products or materials, such as chemicals, or often when worn out. Companies even now replace any tools they furnish should the employee break or wear them out. Tools such as drills are furnished, then replaced; so why stop here? The employee's pliers dulled by cutting steel wire could also be replaced. But it seems that an extensive educational program will be necessary before this is accepted general practice.

Think of the complications this could introduce and how far it could be carried! Whoever received the claims would have to be honest and a capable judge of the possible cause of the tool's condition. The employee could give way to temptation and avoid responsibility for the tool's condition deliberately.

Edward Diskavich
Torrington, Conn.

•

The argument as to who is responsible for tool breakage is an old one. The majority think it is up to the men themselves to show good fellowship.

In my estimation, Bill is absolutely wrong. A man is equipped to suit his trade: A machinist needs small gages, thread feelers, calipers up to 2-in., mikes, etc. A mechanic requires tachometer, box and open-end wrenches, chisels, hammers. Welder and electrician need small tools in their fields and consider as natural wear and tear of their occupation the replacement of a pair of shoes or jumpers, etc. Large tools, intricate and costly gages, whether electrical or manual, are the shop's duty to supply and maintain in all instances.

As Bill borrowed John's dial indicator, it is his moral responsibility to return it as he received it, and be appreciative. It improved his own efficiency or he would not have borrowed it.

Joseph Murray
Astoria, N. Y.

REPORT No. 2

...Saved $6.68 per tool with *TANTUNG!

REPORT No. 1

REPORT No. 2

TOOL ENGINEERING REPORT

DATE 1947

TOOL TRADE NAME *Tantung*

MATERIAL: Nonferrous cast alloy composed of Cobalt, Chromium, Tungsten, Carbon and Columbian/Tantalum carbides.

APPLICATION: For machining and cutting operations at far greater speeds and feeds than high speed steels.

CHARACTERISTICS: Easily ground, Tantung is a tough, shock resistant cast alloy with an extremely low co-efficient of friction and a high red hardness. Ready for use, Tantung does not require drawing or hardening before application.

TYPICAL TANTUNG PERFORMANCE

Material Machined: 416 Stainless Steel, 5/8" hex oil spray jet.

Operation: Seating in bottom of blind hole. Drill press with hand feed. 240 R.P.M.—.020 stock removal.

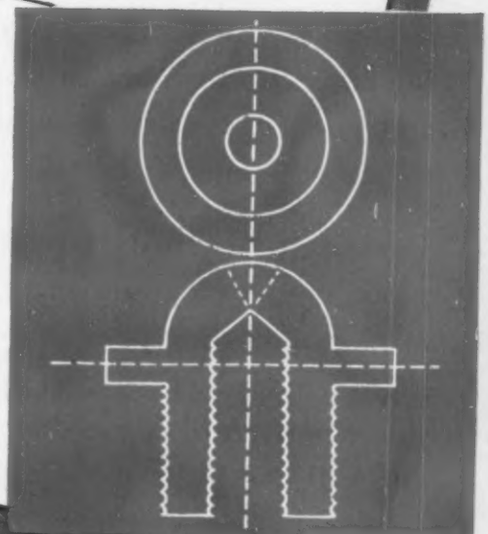
Comparative Test: Number of pieces per grind.

TANTUNG Tool 5000

High Speed Steel Tool 1000

GENERAL ENGINEERING DATA:

Manufacturer estimated labor cost to apply high speed steel tools (harden, draw and grind) was $8.00 per tool. Tantung, centerless ground tool bits cost only $1.32. High speed steel tools chipped just past the nose on the front clearance angle after a run of 300 to 400 pieces. Tantung, in constant operation, has never chipped on the front clearance angle.



Send for your copy of TANTUNG Bulletin VR-227 TODAY!

MAKERS OF WORLD'S FINEST VR Carbides

Reg U. S. Pat. Off.

VASCOLOY-RAMET CORPORATION NORTH CHICAGO ILLINOIS

District Sales and Service in Principal Cities

An affiliate of The Fansteel Metallurgical Corporation and The Vanadium Alloys Steel Company

YESTERDAY'S PIONEER . . . TODAY'S LEADER

Battery of grinding machines especially developed for producing Weldon Carbide Form Tools. (Inset) Note the magnifying screen which facilitates accurate grinding.

NEW WELDON

Carbide Form Tool **DEPARTMENT**

A unique method of grinding developed by Weldon has made possible the production of carbide form tools of unusual precision and quality. With our modern equipment, ample facilities and painstaking inspection we are in position to produce flat and circular carbide form tools in a practically unlimited range of complicated shapes for all uses.

Brazing of carbide tips is done in our own plant, most of it being accomplished by the use of modern induction heat equipment. To uphold the high standard of Weldon quality every detail in the manufacture of carbide form tools is carefully checked and inspected.

Write for Carbide Form Tool Folder No. CT-1

THE WELDON TOOL CO. *Cleveland 4, Ohio*

3000 WOODHILL ROAD

"Quotes"

Carbides in Dies

JOHN KLEINODER of the John Volkert Tool and Die Co. in the symposium "Developing Specialties in Tool and Die Shops," at the National Tool & Die Manufacturers Association annual meeting, said, "Carbides in dies today are so new that even manufacturers of carbides do not yet know just what can be done with them.

"We are using carbides in dies for comparatively thin material only. Experience in making dies for the radio-tube industry has shown us that dies made with carbide cutting and forming sections will outlast the best high-carbon, high-chrome tools at a ratio of from 40 to 100 to 1. These are not figures taken from a book, but from actual production runs in our and in our customers' shops.

"It is true, of course, that these dies are much more costly than any steel dies, as far as the initial investment is concerned. But the subsequent life of the die, as well as the minimum amount of maintenance, brings the die cost per blank to a lower level than could otherwise be realized, provided that the quantities required run into many millions.

"In connection with carbide dies, I would like to point out that they are not by far as fragile as is commonly believed. Carbide can stand a tremendous amount of pressure, and if the alignment between punch and die is accurately held, there is practically no breakage.

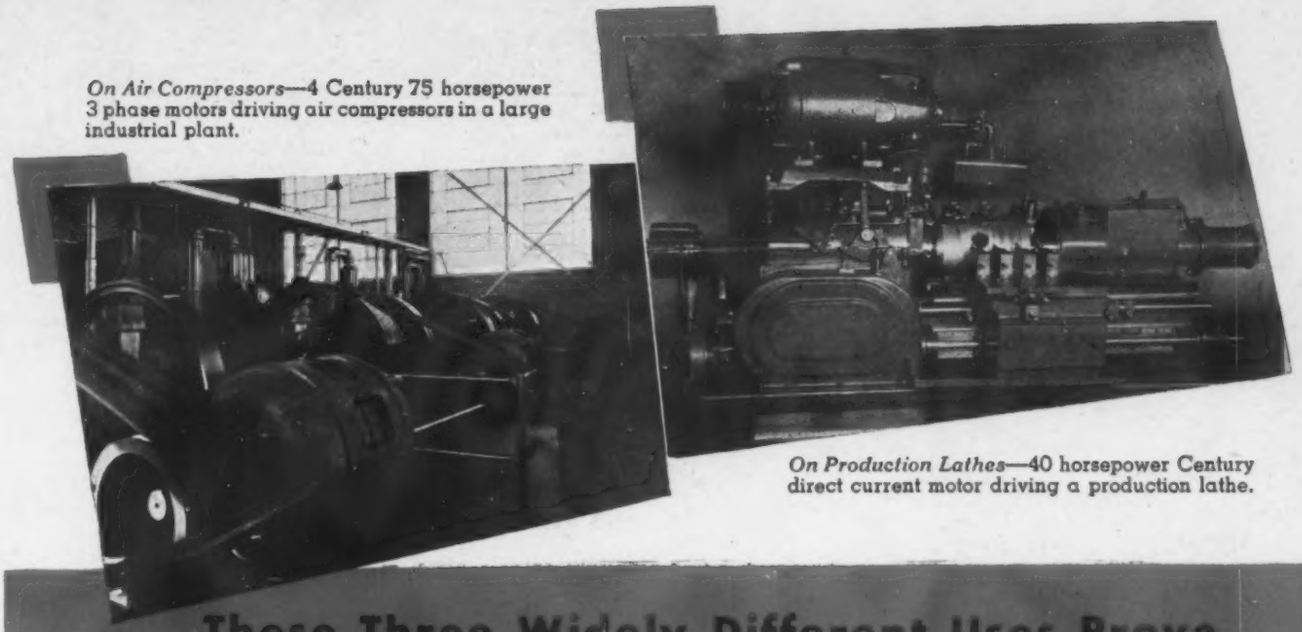
"We have found that the cutting edge of a carbide punch or die will outlast hardened-and-ground steel guide posts and bushings. We have, therefore, substituted, in a few cases, carbide posts and bushings to insure proper alignment at all times."

•

Materials Handling Needs Research

CALLING FOR a continuing program of coordinated, effective research in materials handling, R. F. Weber, in charge of research for materials handling and product protection, International Harvester Co., emphasized its need at the conference held concurrently with the 1947 Materials Handling Exposition.

He brought out that the advantages of a well-planned materials-



On Air Compressors—4 Century 75 horsepower 3 phase motors driving air compressors in a large industrial plant.

On Production Lathes—40 horsepower Century direct current motor driving a production lathe.

These Three Widely Different Uses Prove

CENTURY MOTORS

Can provide

✓ The Right Electrical Characteristics

✓ The Correct Protection

For Nearly Any Application

On Train Washers—12 Century 3 horsepower totally enclosed fan cooled vertical mounted motors driving brushes on a new type train washer.

The complete line of Century motors supplies electric power in such diversity that you can select a motor to meet the requirements for all the popular industrial, commercial and appliance needs.

The three applications shown here are typical of the great variety of applications for Century motors. You will find them giving dependable performance and a long life of satisfactory service in every major industry. Where atmospheric conditions are a hazard, Century motors are furnished with splash proof, totally enclosed fan cooled or explosion proof frames, according to the severity and nature of the hazard.

Century Electric Company

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Offices and Stock Points in Principal Cities

Century C MOTORS

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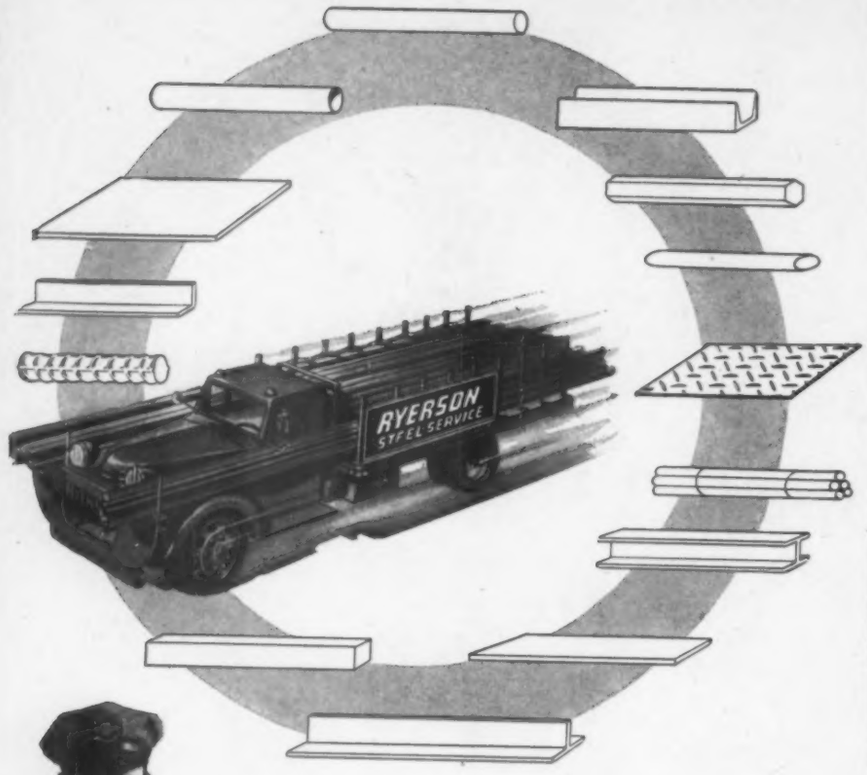


when it comes to steel—

Our Business is YOUR Business

For more than a hundred years, each step forward in American industrial methods has been faithfully reflected in the specialization and development of Ryerson steel. With the coming of each new manufacturing technique, the scope of Ryerson stocks has been increased to include the potential requirements of the operation. And Ryerson service methods have been steadily developed to meet the ever-growing demand for speed and dependability.

During these days of critical shortages, Ryerson policy of prompt personal attention to each order remains the same. Whether your requirements are measured in pounds or tons, they receive the immediate consideration of experienced steel men. And if the steel you need is not readily available from stock, every effort will be made to find an alternate to serve your purpose.

So contact Ryerson when the continued progress of your operation depends on steel. Whether your business consists of a one-room machine shop or an industrial empire, you are always assured of our fullest cooperation and the benefit of unequalled service facilities.

Joseph T. Ryerson & Son, Inc., Steel-Service Plants: New York, Boston, Philadelphia, Detroit, Cincinnati, Cleveland, Pittsburgh, Buffalo, Chicago, Milwaukee, St. Louis, Los Angeles.

RYERSON STEEL

handling research program are to "reduce cost of handling, economize warehouse and storage space, increase plant capacity, reduce inventory, improve product protection, reduce hazards of handling, improve working conditions, facilitate materials control, speed up delivery of product to consumer, develop standard practices and originate specifications and manuals for general usage."

"There is," he said, "an urgent need for standardization of materials-handling facilities in industry. We have made a good start in our own company. Nation-wide, a great deal can be done. Some efforts are being initiated by the U. S. Bureau of Standards which will help to bring about this standardization. I know every organization interested in materials handling will be anxious to help.

"It is a job in which all of us can help. Here is what can be done:

1. Close coordination between industry and materials-handling equipment manufacturers in a research program for future requirements.
2. Intensive research to be conducted in obtaining additional efficiency out of materials available for more economical handling.
3. Increase the scope of usage of palletized shipments for application to a greater variety of items, via rail, truck, steamship and plane, for worldwide distribution.
4. As the result of coordinated research, establish minimum standards applicable to materials-handling facilities, which will have acceptance by industry, suppliers and transportation companies.
5. Promote education and training in the science and practice of materials-handling engineering."

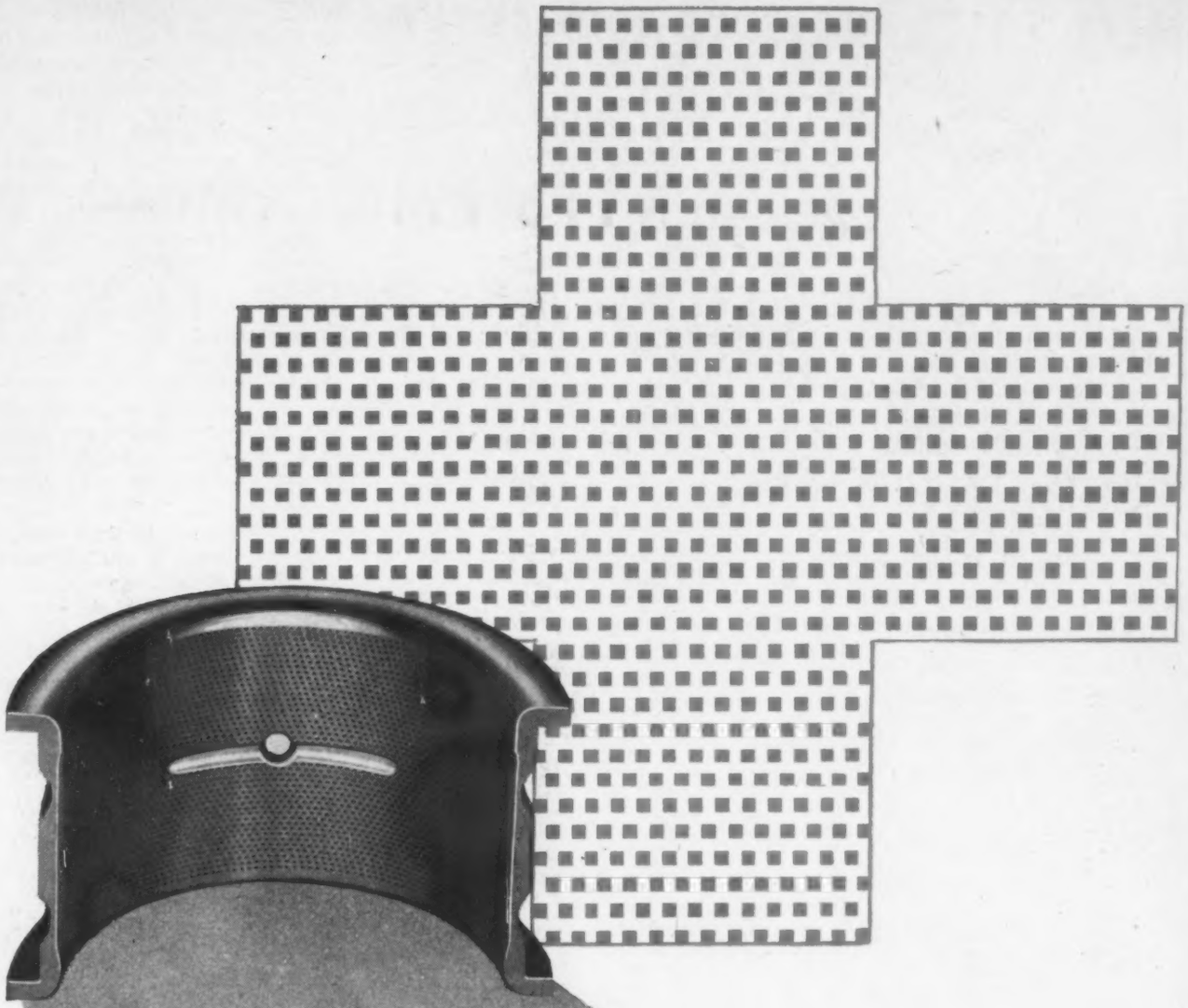
•

Standardization in Materials Handling

W. E. Braithwaite, Asst. Chief Business Specialist, National Bureau of Standards, stressed the value of standardization at the conference held concurrently with the Materials-Handling Exposition. In offering the services of the Division of Simplified Practice, he said:

"Certain types of pallets, skids and containers must be used to obtain best results in handling by the unit-load method. Actual study of the materials to be handled is necessary to determine the correct system.

"In making decisions regarding sizes, weights and methods of pre-



N • B • M GRIDDED BEARINGS MAKE OVERSTRESS "WOUNDS" HEAL BY THEMSELVES

When damage through overstress occurs, the frictional heat will melt some of the silver babbitt metal. It will flow out of the grids and spread over the damaged area, restoring a good bearing surface.

Where high strength, fatigue resistance, and embedability count, centrifugally-cast N-B-M Gridded Bearings add safety and protection for the shaft.

Our exclusive new manufacturing process now makes them available at "mass-production" savings. May we send you complete engineering data?

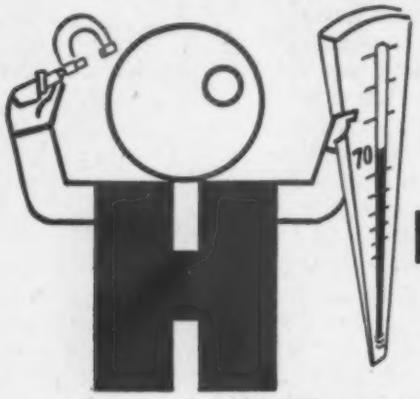
NBM

AMERICAN Brake Shoe COMPANY

NATIONAL BEARING DIVISION
ST. LOUIS • NEW YORK

PLANTS IN: ST. LOUIS, MO. • PITTSBURGH, PA. • MEADVILLE, PA. • JERSEY CITY, N. J. • PORTSMOUTH, VA. • ST. PAUL, MINN. • CHICAGO, ILL.

MEET TOLERANCES CONSISTENTLY



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HOFFMAN EQUIPMENT

for

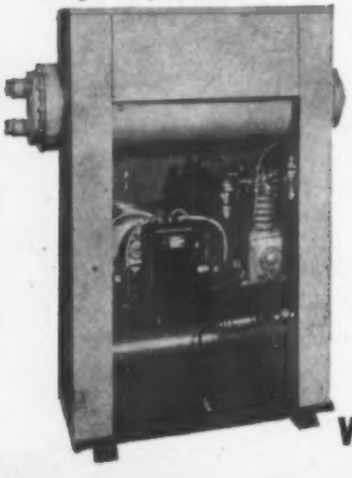
COOLANT TEMPERATURE CONTROL

Keep coolant temperatures *down* and you keep precision work accuracy *up*. Scores of plants equipped with Hoffman Equipment for maintaining coolant at room temperature reap these benefits: increased production because rejects are reduced—because cutting tools and grinding wheels last longer.

Hoffman Units are available either with immersion coils or with heat exchangers capable of handling full flow. They are designed for operation under severe conditions encountered in shop service.

COOLANT TEMPERATURE CONTROL FOR EVERY PRECISION JOB

For thread grinding, lapping and honing, and machining certain materials such as magnesium — and for high production work, there is a Hoffman unit to serve all standard machines using an oily coolant.



(Above) Front view of 1 H.P. Type A Unit, with Aircooled condenser and 930 gal. per hr. capacity. (Left) 3 H.P. Unit with Water-cooled Condenser and 3,600 gal. per hr. capacity. A Hoffman Engineer will help you determine your requirements.

WRITE FOR DETAILS TODAY!

U. S. HOFFMAN MACHINERY CORPORATION
211 Lamson St., Syracuse, N.Y.
COOLANT FILTERS • FILTRATION ENGINEERING SERVICE

paring unit loads, attention should be given to the fact that the load should be prepared to permit delivery direct to the point of usage in the processing line or in storage.

"The examples of what can be done are legion. One good example is that of a large manufacturing concern that formerly packed refrigerator motor parts in individual cars for shipments. Each motor was handled as a unit and, when placed in a box car for shipment, required considerable blocking. Floor space was wasted as it was difficult to tier the packages. Each unit was small and high stacking would necessitate the use of elaborate blocking measures. The pallet method of handling completely eliminated car-blocking requirements.

"Other savings in time and materials were made possible. Formerly, each box required one contents label and one address label, whereas a pallet load of 200 stators, for instance, requires only one contents and one address label, thus saving the combined total of 398 contents and address labels. This method or system also saved approximately an hour and a half of one man's time in placing labels on the cartons.

"Before using palletized loading, this company used individual corrugated containers and could only ship about 1,500 motors in a car. Now they can ship 2,500 motors on palletized loads.

"Efficiency in materials handling has not kept pace with the improved efficiency incorporated in production and processing operations. Tremendous progress has been made, however, and the manufacturers of equipment and materials-handling engineers are alert to the need and the possibilities for standardization of equipment and methods."

Acid Dips Improve Welds

TESTS CONDUCTED by General Electric engineers determined pre-welding dips of aluminum in sodium hydroxide and sulphuric acid resulted in mirror-bright, fine-contoured welds as welded.

After a brief degreasing in a 5% solution of sodium hydroxide to remove grease, oil, or wax, and a brief wash in water to remove most of the caustic and scum, the aluminum was dipped in a 50% sulphuric acid bath. This completed removal of the oxide skin and restored most of the surface brightness, and a hot water bath removed the acid and left the aluminum clean and dry.

VIBRATION CONTROL *is part of design*

JUST as you have specialized in your type of product, so have we specialized in ours. With LORD Vibration Control Products we are cooperating with manufacturers to perfect smooth, quiet operation of their machines.

The best place to apply LORD Vibration Control to your product is on the drawing board; and the best time is when your designs are in the preliminary stage. During this stage, it is easy to select the points which are most advantageous for mounting applications. Space allotments, center-line locations and constructional features can be selected so that the inexpensive standard LORD Mountings may be installed easily when assembly begins.

It is also during this stage that LORD Field Engineers can be of greatest service to you. By using their knowledge and experience in this specialized field, you literally place a trained Vibration Engineer upon your staff without cost. Just drop us a line, or notify our nearest Field Office, and a representative will call upon you. There is no obligation.

RD MANUFACTURING COMPANY, ERIE, PA.

FIELD OFFICES { New York, N.Y. Detroit, Mich. Washington, D.C. Chicago, Ill. Burbank, Cal.
Canadian Representatives: Railway & Power Engineering Corp., Ltd., Toronto, Canada.

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BONDED RUBBER
Shear Type
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. . . Accuracy and Adaptability, too

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NEW BOOKS

HOW TO TAKE PHYSICAL INVENTORY—*By Richard F. Neuschel, Management Consultant, McKinsey and Co., and H. Tallman Johnson, Chief Auditor, Sperry Gyroscope Co., Inc. Published by McGraw-Hill-Book Co., 330 W. 42nd St., New York 18, N. Y. 159 pages. Price $2.00.*

The book is divided into two parts. The first sets forth the principles and techniques for planning and taking a physical inventory. After the nature of the planning job is explained with reference to the wide range of factors influencing it, the operation is broken down into necessary steps.

Among these is the physical preparation for the inventory including advance physical verification and arranging inventory items to facilitate the count. Discussed in succession then are planning the procedures and organization, preparation of procedural instructions in the form of an inventory manual, preparation of inventory forms and supplies and the selection and training of inventory personnel. Pricing, listing and verification of the inventory are treated adequately.

The second part of the book is a 93-page inventory manual that has been used successfully at Sperry. Not only does it illustrate and amplify principles previously discussed, but it also provides detailed information on tagwriting, count checking, listing, tabulating and the many other operations involved in taking a physical inventory.

Although the instructions in the manual relate to inventories of a company that performs precision machining and complex assembly operations, the book should serve as a practical guide even to those engaged in other businesses.

•

FUNDAMENTALS OF SUCCESSFUL MANUFACTURING—*By George Gaynor Hyde, Consulting Engineer. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. 201 pages. Price $2.50.*

A new member of the Industrial Organization and Management Series, this book presents a basic analysis of the fundamentals of modern, successful manufacturing. Intended as a text to assist the reader to think objectively, it stresses importance of

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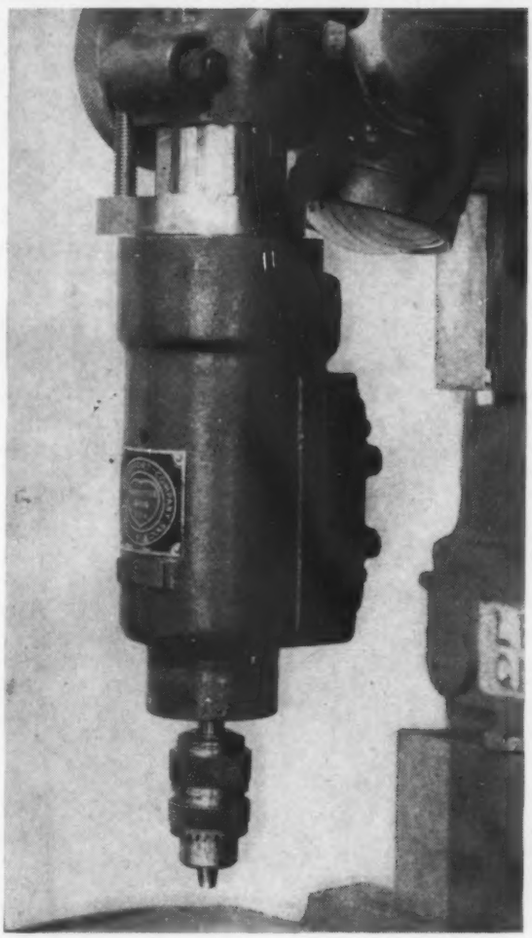

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good organization and development of an objective viewpoint in analyzing manufacturing problems.

Not only does it cover product design, plant and facility layout, formalizing and staffing the organization, personnel practices and related functions, but it also adds interest by the case-history method. It is the author's intent, and a successful one, to help the new manufacturer get his enterprise going and the existing one to revitalize his organization by pointing out the path of objective analysis.

Case histories are worked in skillfully to illustrate ideas. Thus, for flexibility of machine layout, is given: *The Case of the Floating Machines.*

"I know one manufacturer who won't bolt down a machine, unless he has to, because next week he may get an idea that will improve his layout and he doesn't want to cramp his style. All his electrical connections are made through plugs so he can pick up a 36-in. lathe and move it across the shop as you would a fan or an electric toaster."

•

TRADE-MARK ACT OF 1946—*By Harry Aubrey Toulmin, Jr., attorney. Published by W. H. Anderson Company, law book publishers, Cincinnati, O. 224 pages. Price, $5; 10 or more copies, $4 each.*

The Trade-Mark Act of 1946, known as the Lanham Act, is the first comprehensive law enacted for the protection of trade-marks in the United States. Mr. Toulmin, a well-known authority on trade-mark law and author of several books and articles on the subject, has analyzed, annotated and explained the Act in great detail.

Passed and approved by the 79th Congress on July 5, 1946, the Act becomes effective one year from its enactment. Industry generally will find this comprehensive review of the act valuable. The law itself places in one statute all Federal law relating to patents, and repeals prior laws held inconsistent with the Act. It creates new rights, implements our international commitments, and brings the trade-mark laws of the U. S. up to date.

In analyzing the Act, Mr. Toulmin points out how many trade-mark types, which formerly were difficult to protect, can be protected under the Act. This relates to such items as secondary meaning marks, service marks, certification marks and distinctive package designs.

Among advantages of the new law

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Built-in *constant stroke frequency* coordinates operator and hammer at the most efficient "working tempo," results in increased production of close tolerance forgings, reduced reheats, *uniformly accurate forgings and lower machining costs.*

Lobdell-Nazel Hammers are *ready at the push of the switch to strike a more effective blow than other hammers of comparative falling weight.* The *force of the blow can be easily varied,* by the operator, while maintaining the rhythmic cadence of the operation.

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is the fact a trade-mark becomes incontestable and is the property without question of the owner. Heretofore, registration of a trade-mark was only evidence of a claim to the mark.

Trade-marks play such an important part in manufacturing that this clear and concise analysis of the Act will be profitable reading and an important reference manual.

•

EMPLOYEES ARE PEOPLE—WHAT MANAGEMENT OWES THEM AND WHAT IT DOES FOR THEM: *By Harry King Tootle. Published by the McGraw-Hill Book Co., 330 West 42nd St., New York 18, N. Y. 350 pages, 6 x 9 in. Price $3.50.*

Written as a handbook for personnel directors by one of themselves (presently with the *New York Times*), this book also offers practical pointers for anyone else in business who is interested in the human relationships which make it function. Mr. Tootle takes you through the steps from getting yourself hired as a personnel director, setting up your office and your staff, and what happens from there on. And your instructor knows how to smile as he tells you

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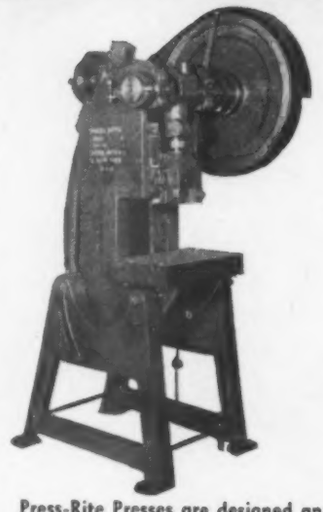

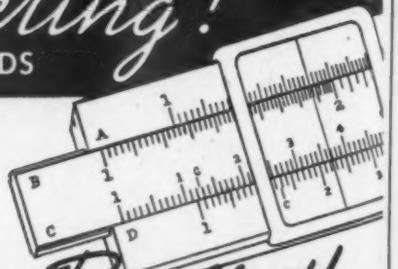

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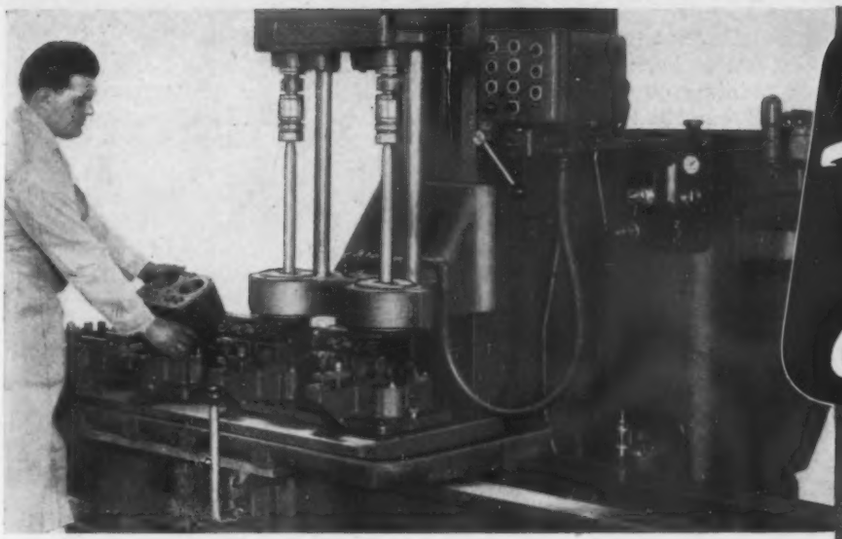
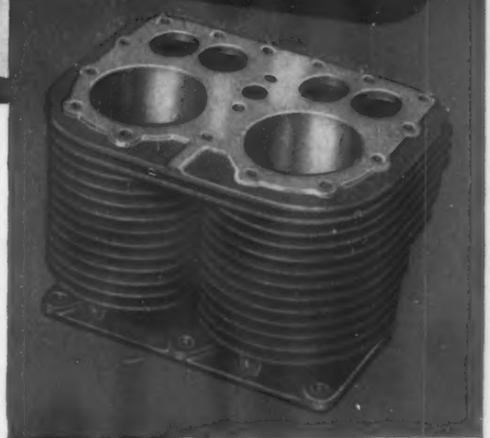


Time Control is Cost Control



No. 307 Honing Machine, with 2-spindle Auxiliary Head and hydraulic Lateral Index Table, for stock removing and finishing 2-cylinder motor blocks.

BORE: 3-1/4" DIA. x 6-1/2" LONG **MATERIAL: CAST-IRON**
STOCK REMOVED: .005" **PRODUCTION: 60 BLOCKS PER HOUR**

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Putting uniform surface control and dimensional accuracy within ten-thousandths of an inch on a production basis is one way to cut manufacturing costs. Either of these operations is time-consuming and requires highly skilled techniques. When both are combined in one automatic operation, greater productivity and savings in time and cost result.

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Check these possibilities against your present operations and costs. If control over surface finish and accurate stock removal is needed in your production, substantial economies will result by honing. Ask a BARNESDRIL Field Engineer to call and discuss the advantages of honing on your work. You will also want to see a copy of our complete Honing Machine Catalog.

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Stock Removed: .005" **Production: 40 pieces per hour.**

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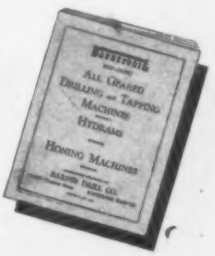

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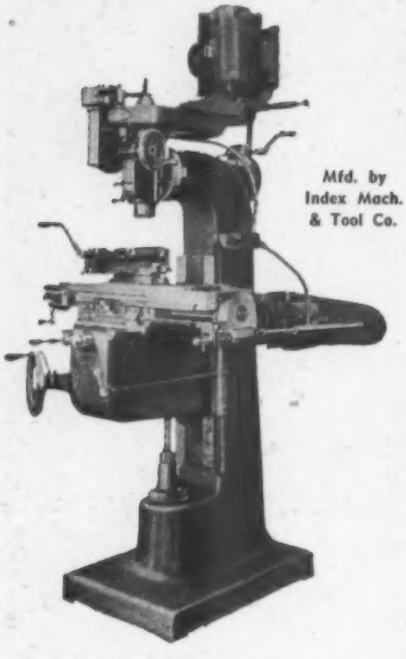

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—from pointing out that your secretary had better be a pearl beyond price to pointing out the matron in the ladies' room had better be the same thing, rather than an old employee's widow handed a job. He's brisk, he's breezy, he's stimulating, he's honest—which is refreshing if you can take informality with your instruction. His book is in effect an elongated after-dinner speech—complete with periodic jokes.

His basic formula is essentially this: Men and women should be treated like people, whether they work for you, you work for them, you work with them, or you're hiring them. The formula, incidentally, will work on any job—and makes the personnel man's job easier.

•

MACHINING ALUMINUM ALLOYS—*Published by Reynolds Metals Co., Dept. 47, 2500 S. Third St., Louisville 1, Ky. 124 pages. Price $1.*

Eight charts giving detailed data on recommended tooling, speeds and feeds for turning, milling, shaping and planing, drilling, reaming, tapping, filing, and sawing are important features of this book.

Machining characteristics of various aluminum alloys are discussed and there are data on tool materials and design, lubricants and cutting oils. Chapters are devoted to each machining operation.

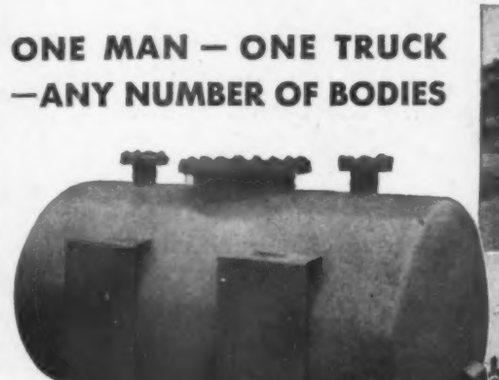
Information in the book is all of a practical nature and there is an extensive bibliography of books and magazine articles on the subject.

•

A WORKBOOK COURSE IN BUSINESS ENGLISH—*By Kate M. Monro. Published by McGraw-Hill Book Co., Inc., 330 West 42nd St., New York 18, N. Y. 171 pages. Price, $1.40.*

While this book is intended primarily for students, many executives and shop supervisors who perforce must write business letters and memos might find it useful as a refresher. Everyone receiving business letters are impressed with the manner in which they are written. Good English, proper punctuation, and clarity are important points. A series of exercises make up the book. The content is presented in four parts: grammatical usage, capitalization, punctuation, the dictionary.

ONE MAN — ONE TRUCK —ANY NUMBER OF BODIES



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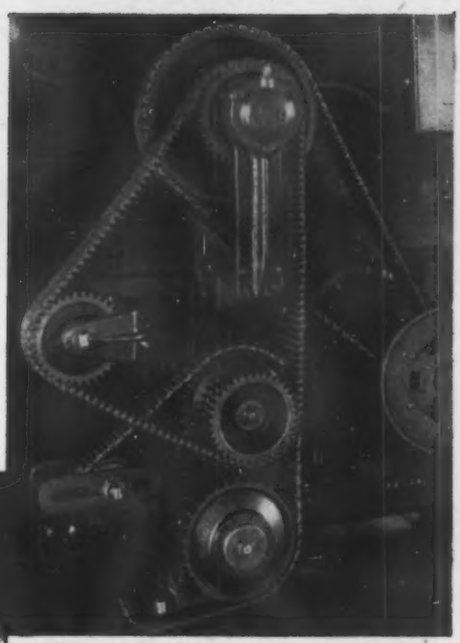

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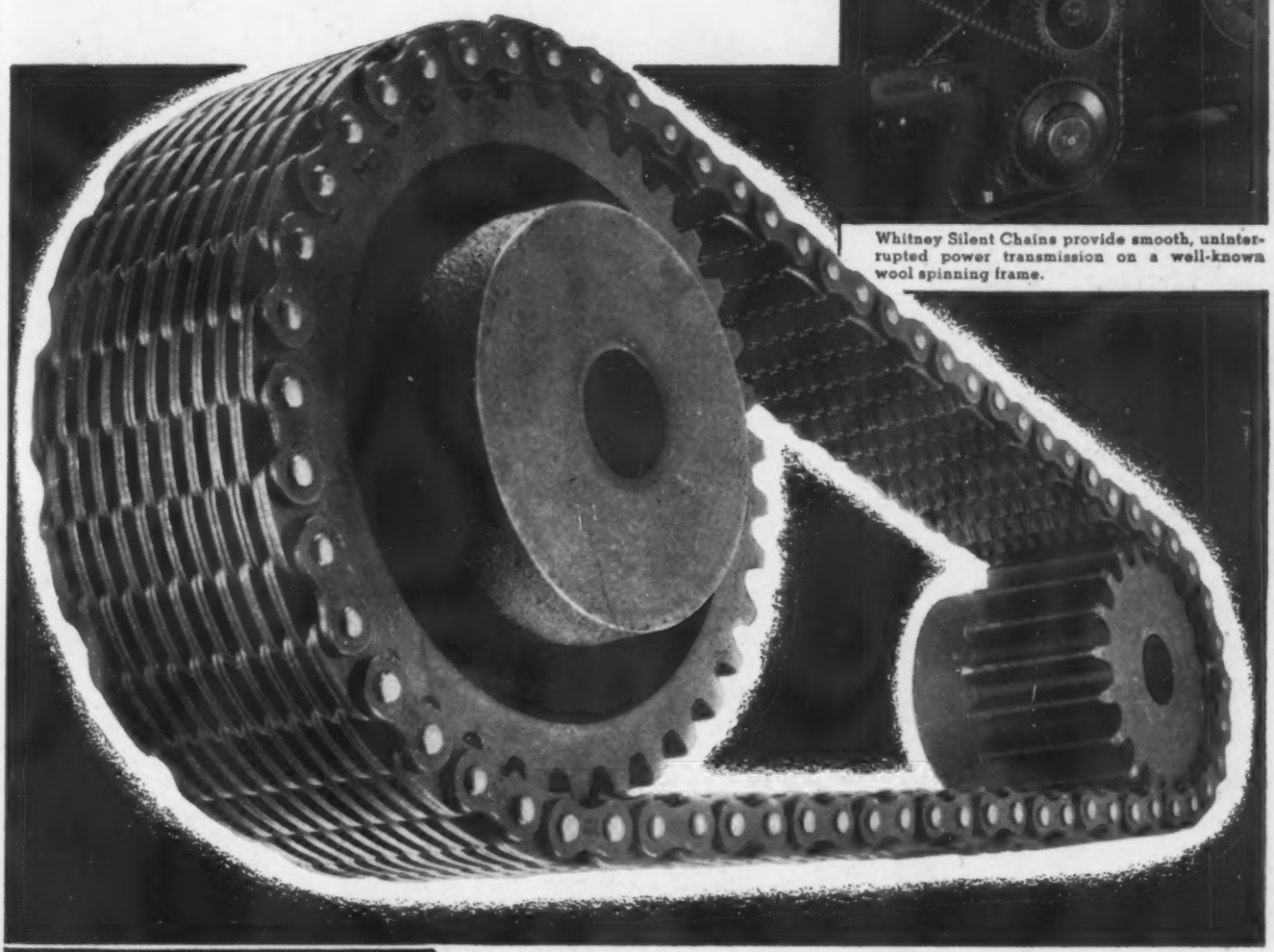

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Because Whitney Silent Chain Drives are unusually flexible and adaptable to a wide variety of designs, they will simplify your power transmission problems, whether it be in textile machinery, processing equipment or machine tools.

Their positive grip assures full power from driver to driven mechanisms without slippage or friction loss. They perform smoothly and efficiently, providing constant speed, thereby helping to maintain product uniformity.

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Look into Whitney Silent Chain Drives . . . the *all steel* power drives . . . for your equipment. They will simplify your design problems . . . save your money with their long trouble-free service. Write for information or engineering assistance.

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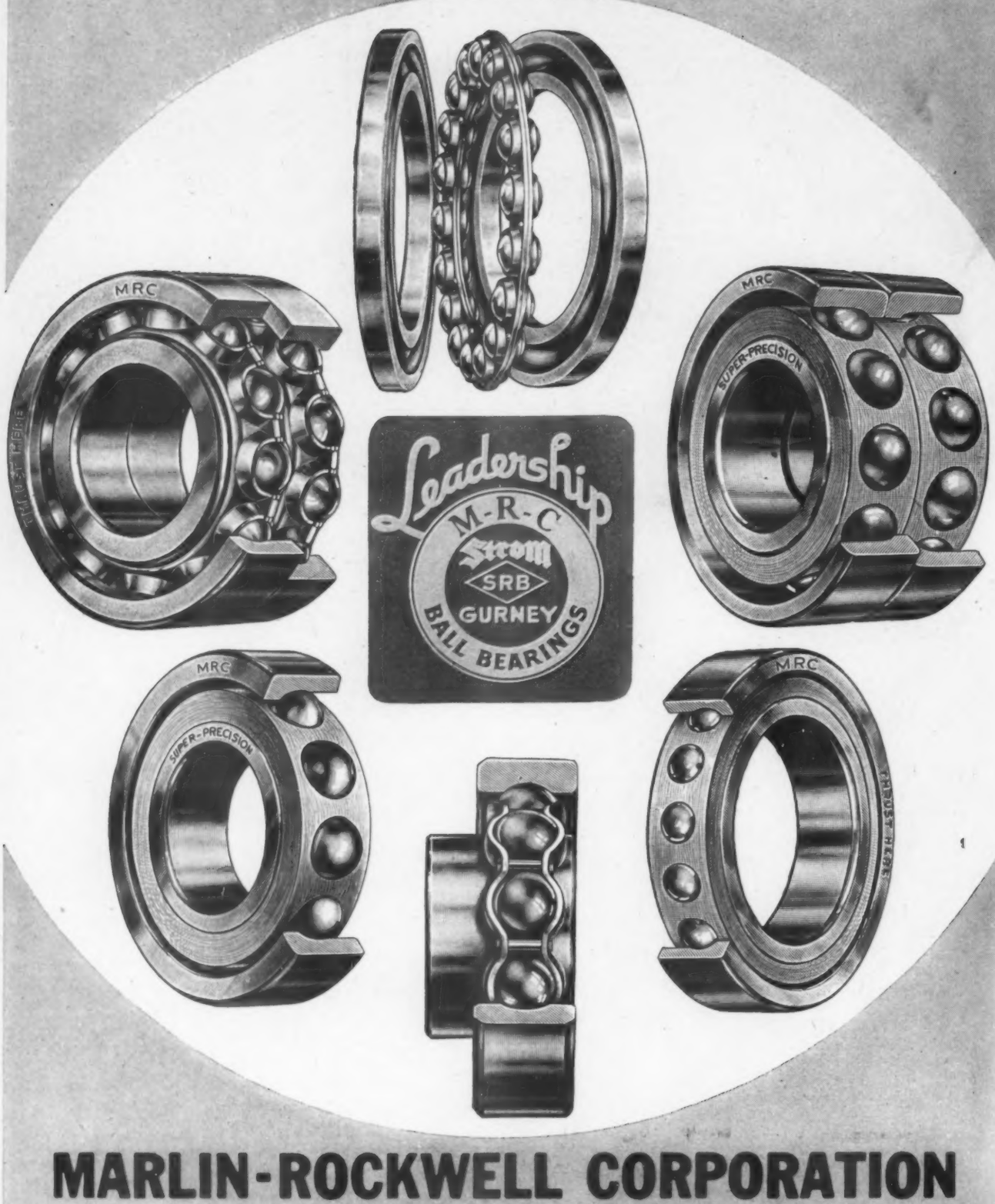

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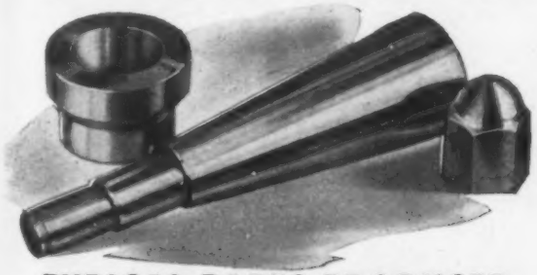

TYPICAL PARTS PRODUCED

(A) Stainless Steel Pipe Fitting from 1½" round, type 430 S. S. stock. Time: 31 sec. per piece.

(B) Tapered Steel Roller from 1⅛" round, SAE 4620 stock. Time: 55 sec. per piece.

(C) Hex nut ¾" from B1113 stock. Time: 8½ sec. per piece (Dual set-up).

SMALL LOTS HANDLED PROFITABLY BY SCREW MACHINE PRODUCTS CO.

Here is more evidence indicating the unusual adaptability of Greenlee Automatics for handling short run screw machine jobs. At Screw Machine Products Co., Milwaukee, 50% of the work produced in 1946 by this battery of 4- and 6-spindle Greenlees consisted of runs between 1,000 and 10,000 pieces. Stock sizes ranged from ¼" to 2⅝" in diameter. Quick change-overs in set-ups and economical tooling were a "must" in meeting competitive market conditions. The experience of this company with the savings made by Greenlee Automatics dates back to 1939 when a 1" 6-spindle machine was installed. Today, the 16 Greenlees in a standardized set-up handle a thriving job shop business.

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WRITE FOR MORE FACTS — SEE MOVIE

Send for a copy of 20-page book explaining timesaving and cost-saving features of Greenlee Automatics. Ask to see new 40-minute sound movie showing the building of a Greenlee "6" from foundry to finished machine.

MULTIPLE-SPINDLE DRILLING, BORING, TAPPING MACHINES • AUTOMATIC SCREW MACHINES • AUTOMATIC TRANSFER PROCESSING MACHINES

when you must maintain quality and still cut costs..

eventually the search leads to *SPEED TREAT*

Republic Aviation had a problem . . . how to build a quality all-metal plane, big enough to carry four people and baggage . . . at a price that would be attractively low. Today's amphibian Seabee was the answer, but it took unusual skill plus patience in determining materials and methods.

For example, the stiffening beads formed in the wing and tail skin-sheet sections eliminated numerous standard airframe members. Here Holliday *SPEED TREAT* provided a real economy. The die shown above for forming the beads, could have been costly. By using free machining fine-finish *SPEED TREAT* for the inserts total cost was surprisingly low.

For quality work at lower cost . . . in die and mold making or for parts that require considerable machining, remember Holliday *SPEED CASE* or *SPEED TREAT* steel plate. Let us give you the facts and you be the judge.

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SPEED CASE – SPEED TREAT Plate Division

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Plants at Hammond and Indianapolis, Indiana

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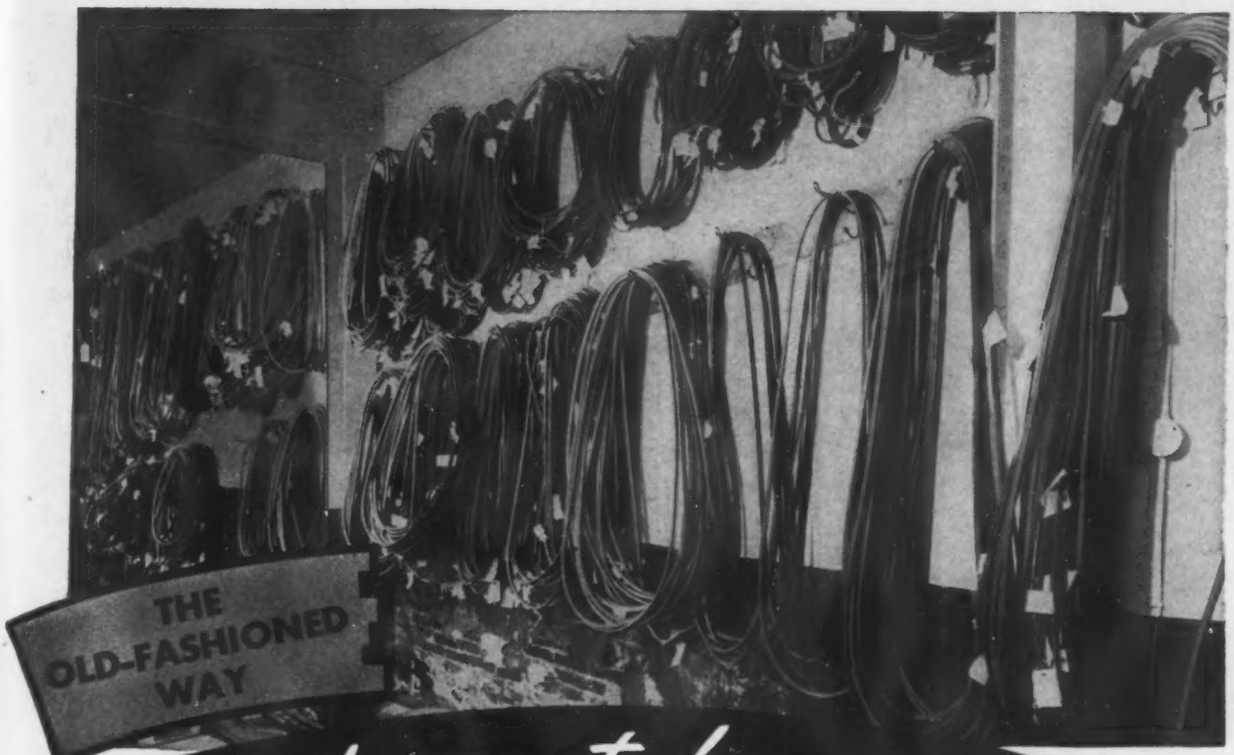
Holliday *SPEED TREAT* is a medium carbon, open hearth, free machining steel plate. One of the Seabee bead forming dies is shown above, with 56 inserts made of *SPEED TREAT*. Thomas Pryde of Pryde Tool & Die Company, well-known tool and die maker of St. Clair Shores, Michigan, worked closely with Republic in the design of the dies . . . and provided the completed die sets with *SPEED TREAT* inserts. The individual inserts were flame-cut from *SPEED TREAT* X-1545 plates, machined to size, and flame-hardened after installation in the die set.

W. J. HOLLIDAY & CO. 91 1856 YEARS of STEEL 1947



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WHY stock a costly and confusing assortment of endless V-belts when you need only a few reels of Veelos, the link V-belt? With only four sizes of Veelos you can make up 316 standard sizes of endless belts. With Veelos, storing spare sets of belts for individual drives becomes outmoded. Expensive, wasteful belt inventories are eliminated . . . deterioration of spare V-belts is ended.

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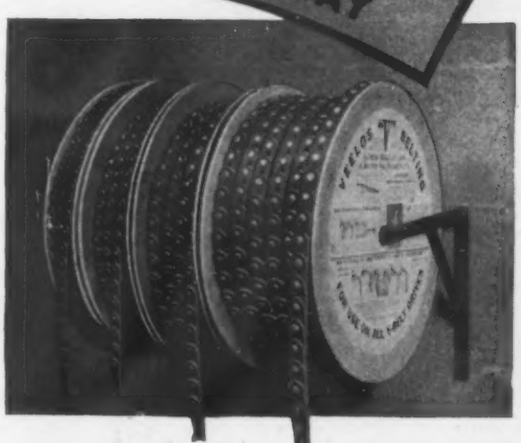
Veelos sales engineers are located in all principal cities; over 300 distributors throughout the country.

THE MODERN WAY



Just four reels of Veelos will provide 316 sizes of endless V-belts.

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+ INCREASED PRODUCTION

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- DAYTON ROGERS DIE CUSHIONS

No matter how you figure it Dayton Rogers Die Cushions will assure better results and lower production costs on your punch press operations because:

1. They are readily adapted to either short run quantity requirements or for large quantity production.
2. They automatically convert a press from single action to double action for deep drawing work.
3. Correct pressure pad control on forming dies obtained quickly by simply adjusting the pressure regulator.
4. They afford positive stripping action on all compound, blanking and piercing dies.

Write for illustrated, engineering catalog #100-1

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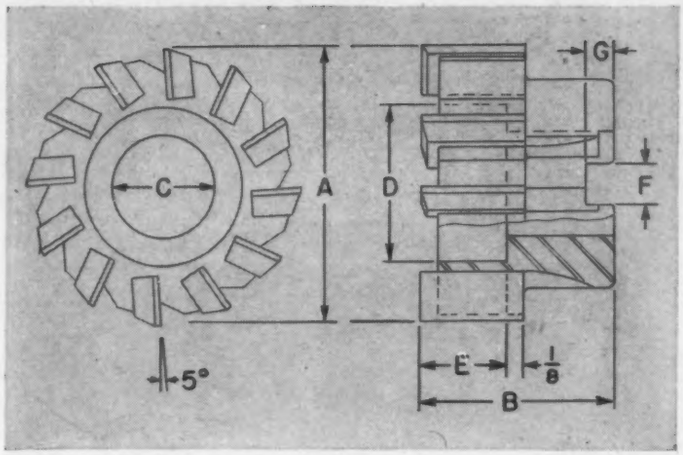
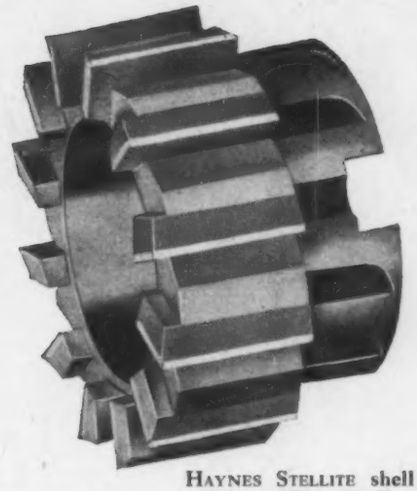




HAYNES STELLITE shell end mills consists of HAYNES STELLITE cobalt-base alloy blades brazed into a tough alloy steel body.

Mill it Faster with HAYNES STELLITE Milling Cutters!

HAYNES STELLITE milling cutters with brazed-in blades are designed especially for faster milling. End mills, such as the one illustrated above, are operated on cast iron, malleable iron, and semisteel, with a chip load of 0.010 to 0.015 in. per tooth. They are used on mild steel with a load of 0.005 to 0.010 in. per tooth. On non-ferrous metals, and on plastics, hard rubber or fiber, the chip load is often increased to 0.030 inch.

These high-production tools can operate at surface speeds of 300 ft. per min. on cast and malleable irons . . . 600 ft. per min. on brass . . . 1,200 ft. per min. on aluminum.

Diameter (A)	Thickness (B)	Hole (C)	Counterbore		Drive Slot		Size of Blades	No. of Teeth
			(D)	(E)	(F)	(G)		
1¼	1	0.500	11/16	3/8	0.260	5/32	3/16 x 1/4 x 1/2	8
1½	1⅛	0.500	3/4	1/2	0.260	5/32	3/16 x 5/16 x 5/8	10
1¾	1¼	0.750	11/16	1/2	0.322	3/16	3/16 x 5/16 x 5/8	10
2	1⅜	0.750	1⅛	5/8	0.322	3/16	3/16 x 3/8 x 3/4	12
2¼	1½	1.000	1⅜	3/4	0.385	7/32	3/16 x 3/8 x 7/8	12
2½	1⅝	1.000	1⅜	7/8	0.385	7/32	3/16 x 1/2 x 1	14
2¾	1⅝	1.000	1⅝	7/8	0.385	7/32	3/16 x 1/2 x 1	14
3	1¾	1.250	1⅞	1	0.510	9/32	1/4 x 1/2 x 1⅛	14
3½	1⅞	1.250	2⅛	1⅛	0.510	9/32	1/4 x 5/8 x 1¼	16
4	2¼	1.500	2½	1¼	0.635	3/8	1/4 x 5/8 x 1⅜	18

Send For Free Booklet

For more information on HAYNES STELLITE high-production cutting tools not only for milling, but also for turning, boring, facing, and other operations, write for the booklet, "HAYNES STELLITE Metal-Cutting Tools," Form 5401.

Sizes other than those shown in the table can be supplied, and standard blades are also available for inserted blade cutters.

HAYNES TRADE-MARK alloys

Haynes Stellite Company

Unit of Union Carbide and Carbon Corporation

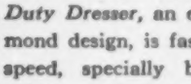
UCC

General Offices and Works, Kokomo, Indiana

Chicago — Cleveland — Detroit — Houston — Los Angeles — New York — San Francisco — Tulsa

The registered trade-marks "Haynes" and "Haynes Stellite" distinguish products of Haynes Stellite Company.

Heft plus



Plus cutters set at an angle to give an extra *shearing* effect (as well as picking action of the Huntington-type cutters). This *Heavy Duty Dresser*, an exclusive *patented* Desmond design, is fastest and best for high-speed, specially bonded wheels. Cutter spindle mounted in dust-protected ball bearings, a *must* for this type of service. Cutters replaced quickly without bearing adjustments. Buy from your mill supply distributor. Write for complete catalog.

The Desmond-Stephan Mfg. Co. • Urbana, Ohio

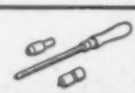
Desmond

the only complete line of grinding wheel

DRESSERS & CUTTERS

BALL BEARING DRESSERS

REVOLVING CUTTER TYPE DRESSERS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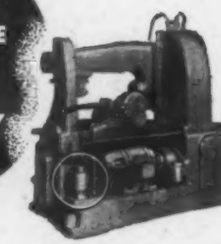
SIMPLE STURDY SATISFACTORY



RUTHMAN GUSHER

COOLANT PUMPS

Photos Courtesy Barber - Colman Company Rockford, Illinois The Etna Machine Co. Toledo, Ohio

Simply designed, with fewer moving parts, Ruthman Gusher Coolant Pumps are quickly and easily installed. Their over-all sturdy construction assures you long trouble-free life and satisfactory service under every plant condition. Remember there's a type and size to meet any coolant requirement.

Illustrated at the left above is a 1/10 H.P. Model 4 P-3 Gusher Coolant Pump on an Etna #150 Swaging Machine. Below is a Model 11021 Long Gusher Coolant Pump on a Barber Colman Type "D" Hobbing Machine.

Write for Catalog 10-A

Model 11020

THE RUTHMAN MACHINERY CO.

1818 Reading Road Cincinnati, Ohio

TAPPING PRODUCTION *Increased 400%*

WITH STANDARD WALKER-TURNER

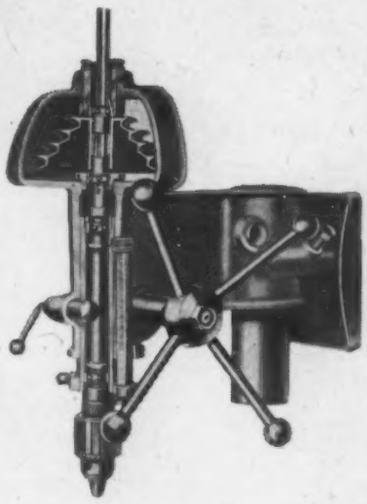
15" DRILL HEADS

Five Walker-Turner 15" Drill Units with Pond conveyer set-up.

This set-up for tapping, aesigned by Pond Engineering Co., Springfield, Mass., and using standard Walker-Turner 15" Drill Heads showed "*better than a 400% increase in production over conventional methods.*"

Two pieces are handled simultaneously, one having three holes to be tapped, the other two. The operator places the pieces on the conveyer plates. The Pond Conveyer and the Walker-Turner Drill Presses do the rest automatically, and finished pieces drip into containers at the other end.

Walker-Turner Heads were chosen for this set-up because the Pond engineers wanted a light-weight, compact unit with extreme flexibility as to mounting, speeds and control. The unique design, rugged construction and low investment cost were other factors in the decision.



No. 9D13X, 15" DRILL HEAD

6 spline spindle, 4 bearing, 4¼" spindle travel, speeds with 1740 r.p.m. motor 600 to 5000 r.p.m.

*Price less motor and column **$42.50**

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METAL-CUTTING BAND SAWS • POLISHING LATHES • FLEXIBLE SHAFT MACHINES
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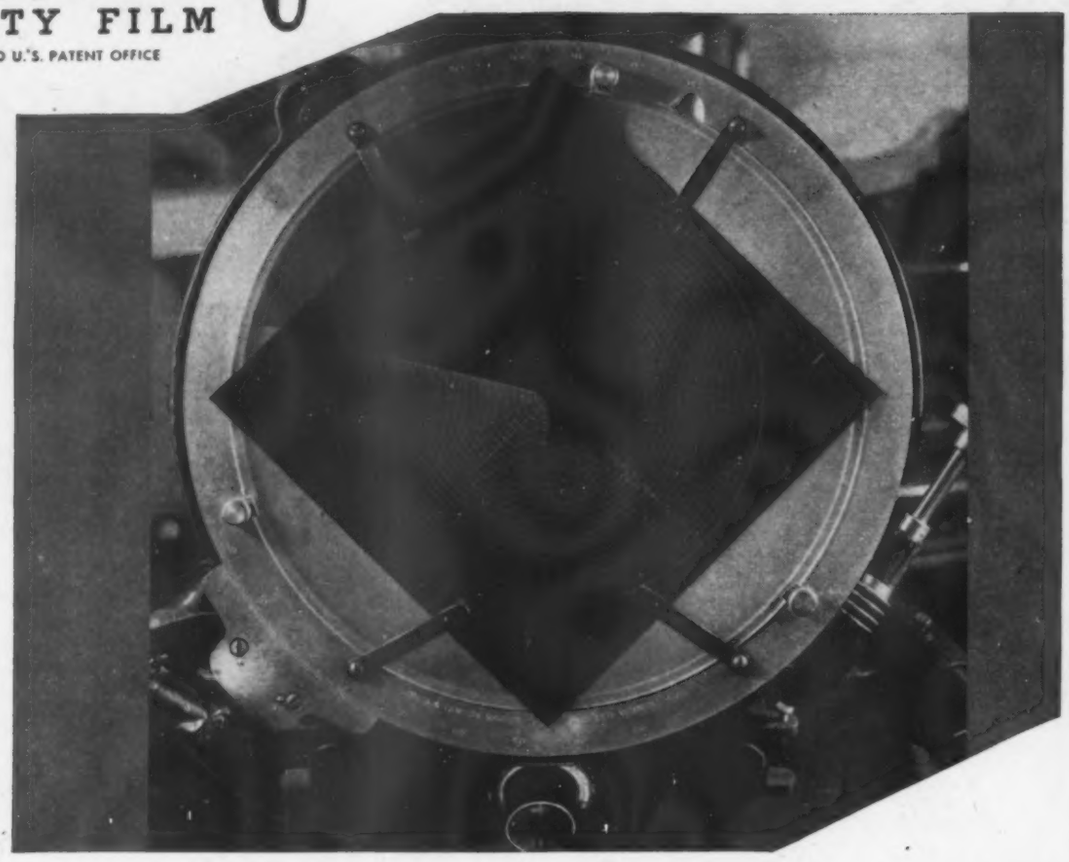

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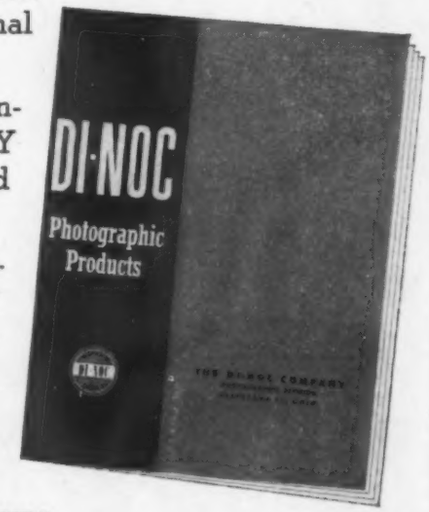

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FREE LITERATURE

New Catalogs, Booklets, Bulletins

(Not good after August 1, 1947)

MACHINES AND ATTACHMENTS

1 GEAR SHAPERS—The Fellows Gear Shaper Co., Springfield, Vt. 70-page revised book, "7-Type High-Speed Gear Shapers," describes line, gives operating details and includes tables and general information.

2 TURNING MACHINE—Potter & Johnston Machine Co., Pawtucket, R. I. 6-page bulletin 121 describes and illustrates 3U automatic chucking and turning machine and lists general dimensions. Unit has 6-face turret, 48 spindle speeds, 8¼-in. dia. swing over cross-slide.

3 SHAPERS—Western Machine Tool Works, Holland, Mich. 20-page bulletin 4620 on Steptoe shapers made in seven sizes with ram strokes from 14¾ to 24¾ in. Units have centralized control, instantaneous speed and feed change.

4 BLAST CLEANING — Pangborn Corp., Hagerstown, Md. 20-page bulletin 214 covers Rotoblast airless blast cleaning which uses centrifugal force instead of compressed air. Abrasive is fed into rotating, vaned wheel and thrown at surface.

5 POWER TOOLS — Aristo Power Tools, Inc., Chicago 6, Ill. 34-page catalog 1 includes AristoCraft power drills, grinders, buffers, brushes, presses, blowers and shafts. Also covers drill stands, power disks, Salsbury airgun and toolbits. Includes price list.

6 SURFACE GRINDER—E. R. Roderick Co., Cambridge, Mass. Folder describes portable grinder for small tool surface-grinding requirements. Longitudinal traverse is 6⅛ in., vertical and cross traverse are 4 in.

7 HOLE LOCATING—The Bullard Co., Bridgeport 2, Conn. 12-page bulletin on Man-Au-Trol Spacer, a semi-automatic movable worktable in two sizes for positioning work in predetermined locations under radial drill spindles. Also available is booklet, "Proved Interchangeability Without Jigs."

8 PUNCH PRESSES—Sales Service Machine Tool Co., Inc., St. Paul 4, Minn. 4-page bulletin covers Press-Rite punch presses built in three sizes with capacities of 5, 10 and 18 ton. Includes specifications.

9 MULTIPLE HEADS—Langelier Mfg. Co., Providence, R. I. 4-page bulletin describes fixed-center, multiple-spindle drill-heads and includes applications on special Langelier machines.

10 SPECIAL MACHINES — Baker Brothers, Inc., Toledo 10, Ohio. 16-page bulletin describes and illustrates multi-operation machines. Also covers heavy-duty drills, keyseaters and cutters, and contour grinders.

11 DRILLING AND TAPPING — Kaukauna Machine Corp., Kaukauna, Wis. 22-page catalog describes Series 125 portable horizontal drilling and tapping machines. Gives specifications, operation and drawings. Also covers Model 700 indexing table.

12 SURFACE GRINDERS—Hanchett Mfg. Co., Big Rapids, Mich. 10-page bulletin 847-1 describes reciprocating-table vertical-spindle surface grinders. Includes grinding procedures and machine data.

13 STANDARDIZED UNIT—Robbins Engineering Co., Detroit 3, Mich. 8-page bulletin on No. 3 Drillmatic, a standardized unit for single-purpose adaption to drilling, reaming, tapping and boring operations.

14 PORTABLE TOOL—Precise Products Co., Racine 1, Wis. 6-page bulletin describes Precise 40, a 40-oz., 1/5-hp., 40,000-rpm. electric handtool for grinding, milling, drilling, deburring, polishing. It can be mounted on stand, vise, lathe, milling machine.

15 SPECIAL MACHINES—The Bunell Machine & Tool Co., Cleveland 14, Ohio. 32-page bulletin 471 describes facilities of company for design and manufacture of special machines and equipment, tools, dies, jigs, gages and fixtures. Illustrates various products.

TOOLS AND ACCESSORIES

16 CEMENTED CARBIDES—Kennametal, Inc., Latrobe, Pa. 64-page catalog 47 includes Kennametal standard tools, tools with "clamped-on" tips, boring tools, tool blanks, fly cutters, face mills, saws, drills and centers.

17 ABRASIVE PEBBLES—Minnesota Mining and Mfg. Co., St. Paul 6, Minn. 10-page bulletin describes Honite honing pebbles used for deburring and finishing small metal parts. Available in two types and nine sizes, the pebbles are natural stone.

18 COUNTING MACHINES—F. B. Redington Co., Chicago 7, Ill. 16-page bulletin on automatic counting machines used to count output of machine tools, pumps, conveyor lines and other units.

19 MAINTENANCE TOOLS — Owatonna Tool Co., Owatonna, Minn. 20-page bulletin describes industrial maintenance tools including Grip-o-matic Pulley and Push-Pullers for removing and replacing parts such as gears, bearings, pulleys, shafts and wheels.

20 END MILLS—Morse Twist Drill & Machine Co., New Bedford, Mass. 16-page catalog on Hi-Helix End Mills, which are both single- and double-end types of 18-4-1 high-speed steel. Also available is folder on line of short standard drills from 1/16- to 2-in. dia.

21 HEIGHT GAGE—Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn. 4-page bulletin 486 covers Electrolimit height gage which consists of reversing head, gage stand and portable instrument cabinet. Gaging pressure is 8 oz., columns are either 12 or 24 in.

22 INSPECTION SYSTEM — Arma Corp., Brooklyn 32, N. Y. 6-page bulletin describes and illustrates Limitron automatic electronic inspection systems in table or bench models. Special turntable model inspects 3,000 to 7,000 pieces per hr.

23 CUTTING TOOLS—Nelco Tool Co., Brooklyn 31, N. Y. Revised catalog describes line of Carboloy-tipped cutting tools with information on operation and maintenance. Includes conversion table, re-sharpening procedures and price lists.

24 BROACHES—National Broach and Machine Co., Detroit 13, Mich. 8-page bulletin describes and illustrates Red Ring Naloy broaches including involute-spline, double-jump and sizing types. Includes information on handling.

Example

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FREE LITERATURE

25 CUTTING TOOLS — Super Tool Co., Detroit 13, Mich. 36-page catalog 47 covers carbide-tipped cutting tools, including new ejector-type toolbit. Also contains selection charts and prices.

26 GAGES—Vinco Corp., Detroit 27, Mich. 300-page book "Millionths of an Inch for Sale by Vinco", includes thread, involute-spline, taper, plain-cylindrical, serration-spline, munitions and other gages, wheel dressers, optical dividing heads, jigs and fixtures and miscellaneous products.

HEAT-TREATING AND WELDING

27 STUD WELDING — Nelson Sales Corp., Lorain, Ohio. 36-page catalog 47A describes electric-arc stud welder, giving operating principles. Includes single- and multi-gun units, and studs for various jobs with specifications and properties.

28 OVENS—Despatch Oven Co., Minneapolis, Minn., 12-page bulletin 51 describes finish baking and drying ovens for processing synthetic-enamel and other finishes. Includes information on proper materials handling system.

29 WELDING, CUTTING — Wall Chemicals Div., The Liquid Carbonic Corp., Chicago 21, Ill. 28-page catalog describes Gasweld welding and cutting equipment and supplies such as torches, regulators, tips, and cutting and welding outfits.

30 HEAT-TREATING FIXTURES — Driver-Harris Co., Harrison, N. J. 24-page bulletin F-46 on heat-treating fixtures for pit-type furnaces serves as aid for solution of furnace-loading problems. Fixtures are made of D-H Nichrome and Chromax.

31 ELECTRODES — Alloy Rods Co., York, Pa. 8-page bulletin covers arc-welding electrodes for various metals. Includes description of coatings such as Lime, Titania and AC-DC.

32 THERMOSTATS — Fenwal Inc., Ashland, Mass. 58-page catalog on Thermoswitch thermostats gives facts on proper application for heat control. Describes principles of operation and control and includes price list.

PLANT SERVICE EQUIPMENT

33 MATERIALS HANDLING — The Yale & Towne Mfg. Co., Philadelphia Div., Philadelphia 24, Pa. 70-page "How" booklet discusses fundamentals and methods of materials handling. Describes "Vis-O-Graf" and "Vis-O-Graf Summary" method of determining required handling equipment, time and personnel for materials in process. Included are blank "Vis-O-Graf" and "Summary" booklets with templet rule.

34 TAKE-UP REELS—Appleton Electric Co., Chicago 13, Ill. 50-page catalog 504 describes Reelite automatic take-up reel for electric cable, Aireel automatic take-up reel for air hose and Retrac-O-Reel spring-operated balance reel for portable tools.

35 PLATFORM TRUCK — Automatic Transportation Co., Chicago 20, Ill. 6-page bulletin describes Transporter 4000- or 6000-lb. capacity, pallet or platform truck. Lifting is hydraulic, drive is electric and controlled through handle.

36 BATTERIES—Gould Storage Battery Corp., Depew, N. Y. 24-page catalog 100 on Kathanode Glasskiad batteries for industrial truck and tractor service. Describes performance and features and gives technical data.

37 LOCOMOTIVES — The Whitcomb Locomotive Co., Rochelle, Ill. Catalog includes 3- to 30-ton Diesel-mechanical locomotives for industrial service and 25- to 80-ton Diesel-electrical locomotives for industrial and railway service.

38 CRANES — Bedford Foundry & Machinery Co., Inc., Bedford, Ind. 54-page catalog describes overhead electric traveling cranes. Discusses brakes, drives, cabs, lubrication and illustrates applications.

PARTS AND MATERIALS

39 METAL TREATMENT — Parker Rust Proof Co., Detroit 11, Mich. 44-page catalog on Bonderizing treatment for anchoring paint and retarding corrosion on steel, aluminum, zinc. Discusses use of method on die castings and in deep drawing steel and aluminum.

40 CLAD STEELS—Lukens Steel Co., Coatsville, Pa. 16-page bulletin 338 describes line of stainless clad steels and gives applications. Includes several pages of corrosion data, size and weight tables.

41 MOISTURE SEPARATOR—Beach Precision Parts Co., Boonton, N. J. 4-page bulletin on Sta-Dri moisture and oil separator for compressed-air outlets. Made in two models that handle 30 or 65 cfm. of air at 100-lb. pressure.

42 COMPRESSED AIR — The Wayne Pump Co., Fort Wayne 4, Ind. 16-page booklet describes Wayne Auxiliary Unit Plan for decentralizing industrial air supply and using smaller units. Wayne compressors are twin and single stage from 1.4 to 40 cfm.

43 SPEED SELECTOR—Speed Selector, Inc., Cleveland, Ohio, and The B. F. Goodrich Co, Akron, Ohio. 4-page bulletin describes Variable-V-Planetary infinite-ratio Speed Selector which provides speeds from 0 to 800 rpm. at constant torque from constant speed source.

44 ADHESIVE PRODUCTS — Mystik Adhesive Products, Chicago 39, Ill. Bulletin describes Self-Stik adhesive products. Included are free samples such as cloth tape, stencils, paper masking tape, waterproof cloth tape and Mystik-Print.

45 MOTORS—Wagner Electric Corp., St. Louis 14, Mo. 8-page bulletin MU-25A describes and illustrates fan-cooled and non-ventilated types of totally enclosed motors for application to machine tools.

46 ELECTRONIC CONTROLS — Wheelco Instruments Co., Chicago 7, Ill. 20-page bulletin 3-6400 describes measuring and control systems, "Electronic Control Principle," "Multronic" and other controls. Describes equipment and includes price list.

47 GEARS—Moore Steam Turbine Div., Worthington Pump and Machinery Corp., Wellsville, N. Y. 12-page bulletin describes double helical gears for use on turbine and driven machine. Gives specifications and dimensions and applications.

48 CONTROLS—B/W Controller Corp., Birmingham, Mich. 28-page catalog 147 on electric Floatless Liquid Level and industrial controls includes induction relays, multiple-pump controls, special controls and application diagrams.

49 CLAMP UNIT — John S. Barnes Corp., Rockford, Ill. 2-page bulletin describes Rapidraulic Junior hydraulic clamp unit with pressure adjustment to 500 psi. for clamping applications requiring a large volume of fluid in a short time.

50 CUTTING OIL—Machinery Lubricants, Inc., Boston 16, Mass. 6-page bulletin describes application of "Silver-Chip" synthetic non-petroleum cutting oil.

51 V-BELTS—Allis Chalmers Mfg. Co., Milwaukee, Wis. 144-page catalog describes Texrope drives. Over 22,000 drives from one to 150 hp. listed to meet conditions including hp., motor speed, ratio and driven speed.

52 METAL STAMPINGS — Dayton Rogers Mfg. Co., Minneapolis 7, Minn. 4-page bulletin describes service for producing metal stampings in small lots with 24x24-in. maximum blank size, ½-in. maximum blank thickness.

53 PRECISION BALLS — Vulcanite Portland Cement Co., Willow Grove, Pa. Three bulletins describe applications of Universal Precision Balls made of steel, bronze and special materials. Also available is folder listing sizes and prices.

54 SOLDERLESS WIRING—Aircraft-Marine Products, Inc., Harrisburg, Pa. Data book on line of solderless-wiring devices includes features, applications and charts. Book contains actual samples of various terminals.

MISCELLANEOUS

55 BOOKS—John Wiley & Sons, Inc., Publishers, New York 16, N. Y. 270-page catalog describes Wiley books from aerodynamics to zoology. Includes brief description of each book with price.

56 STAMPING MANUFACTURERS—Pressed Metal Institute, Cleveland, Ohio. Directory, "The Blue Book of Stamping Manufacturers," in second edition, is available to purchasers of stampings. Gives alphabetical and geographical listings and facilities list of members.

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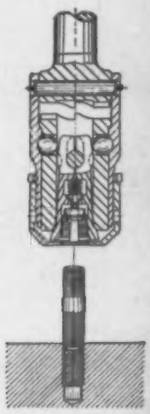
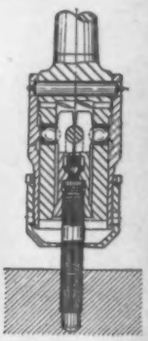
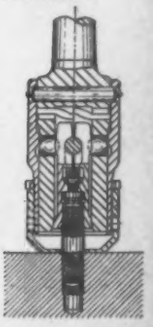


Tool brought to position over stud, ready to begin drive.



Start of the drive with tool engaged on the stud.



Drive completed. Clutch released.

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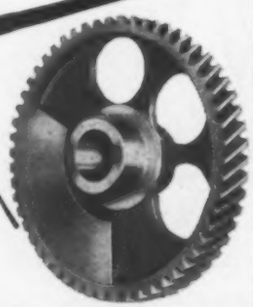

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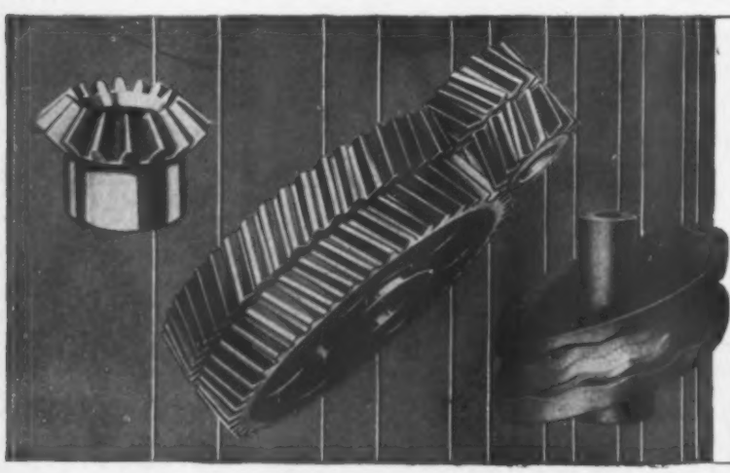

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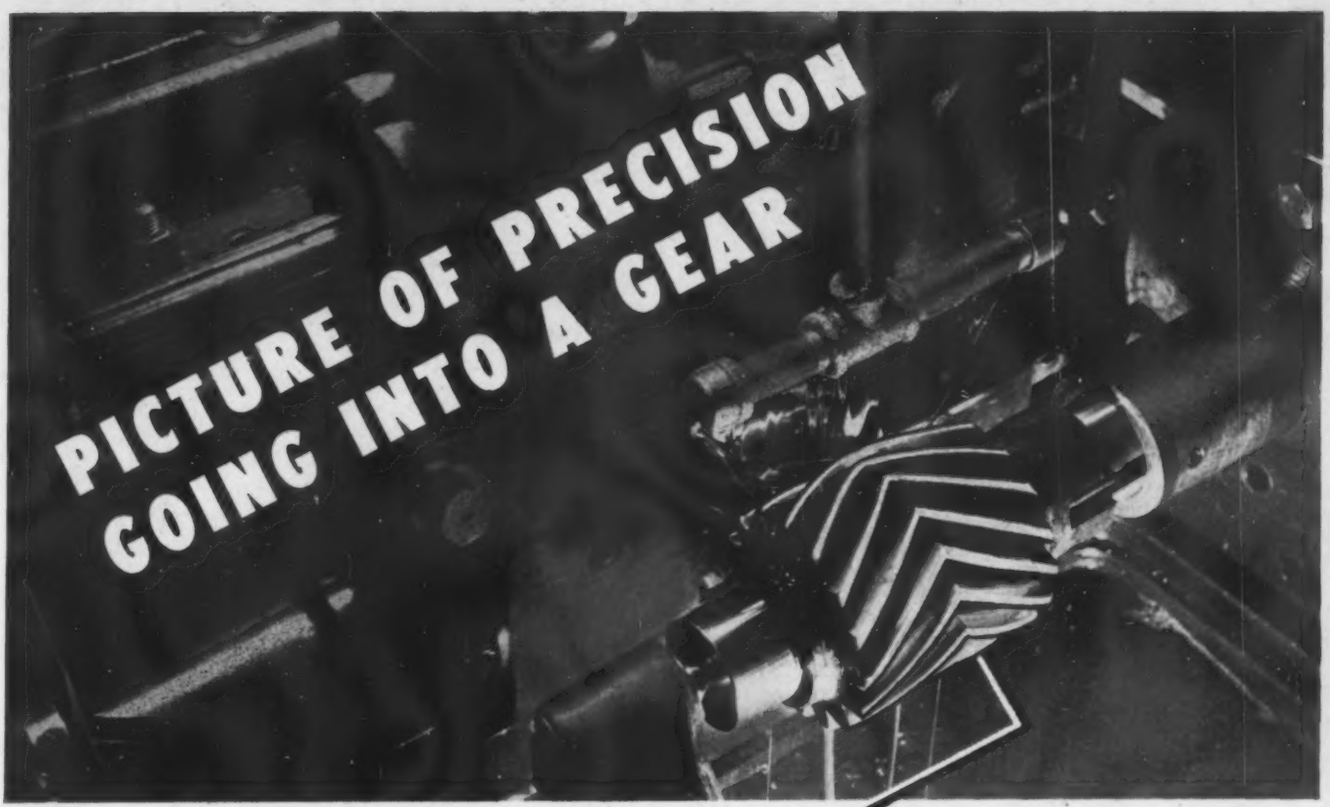

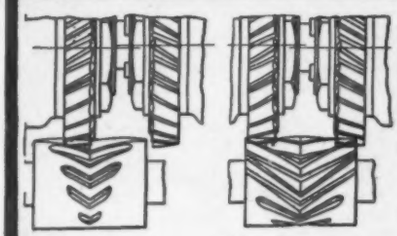

The cutters of Farrel-Sykes machines reciprocate, one cutting when movement is in one direction and the other when the movement is reversed. Each ends its stroke at the center of the blank. As they cut they twist to generate the helices and also slowly revolve in unison with the gear blank to generate the tooth contours precisely.

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FARREL
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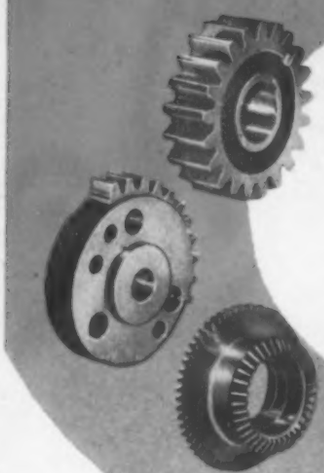

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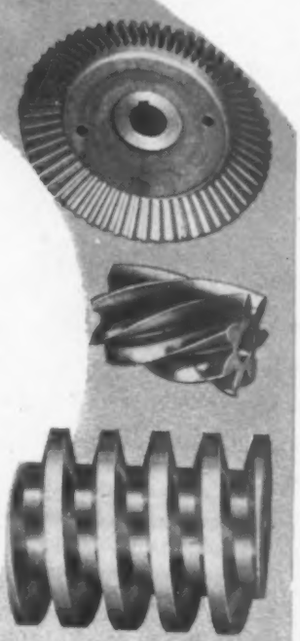

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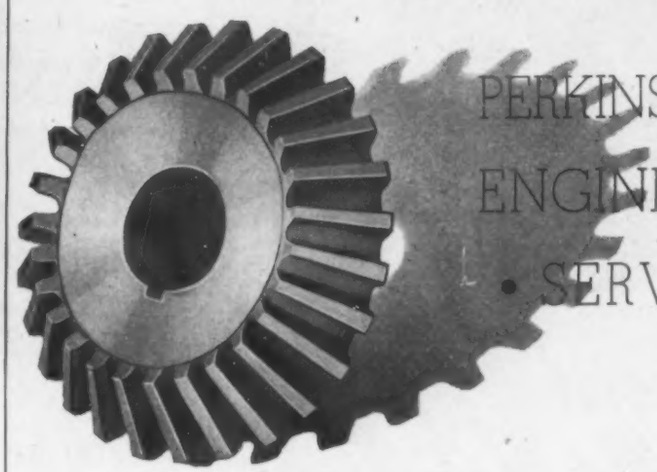

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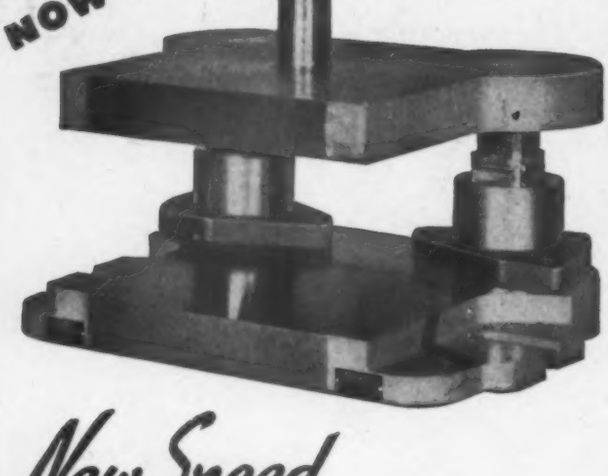

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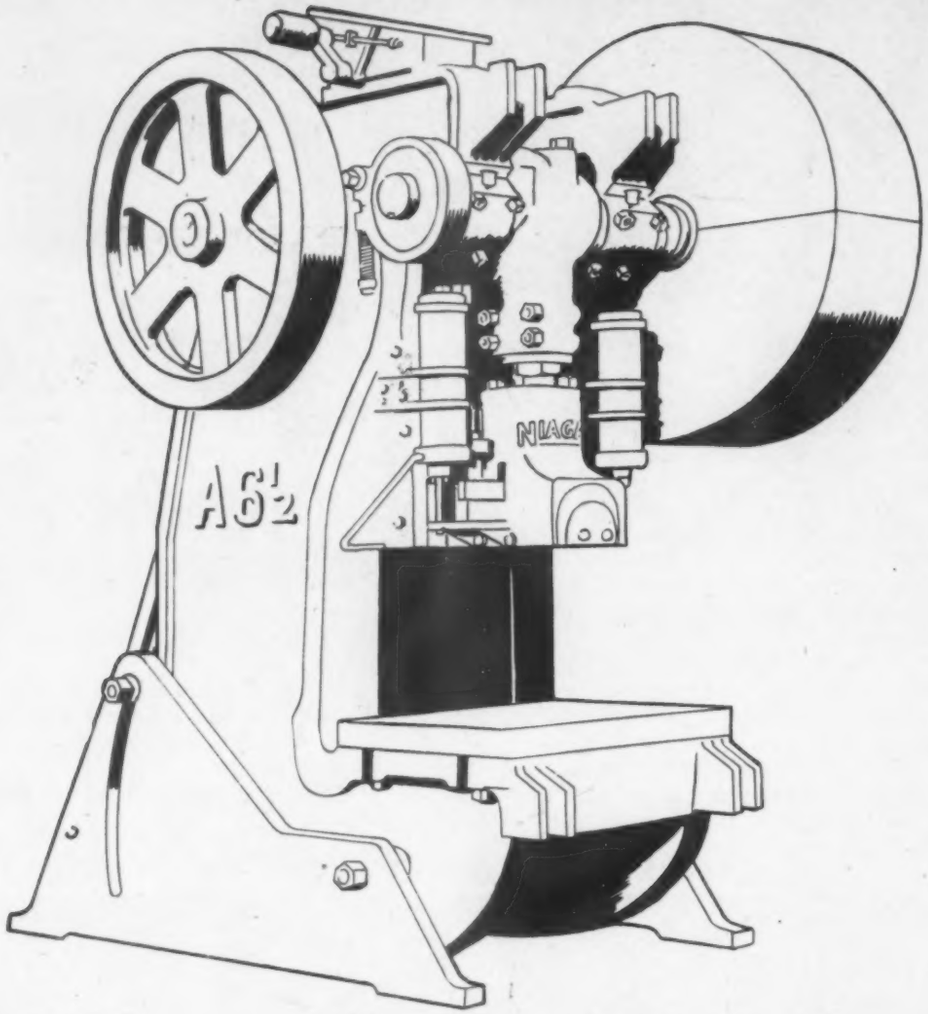

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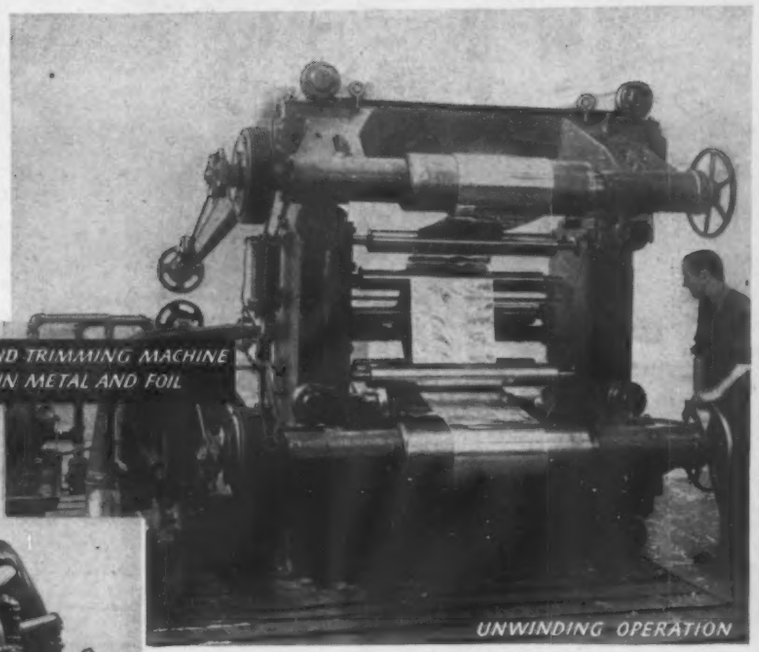

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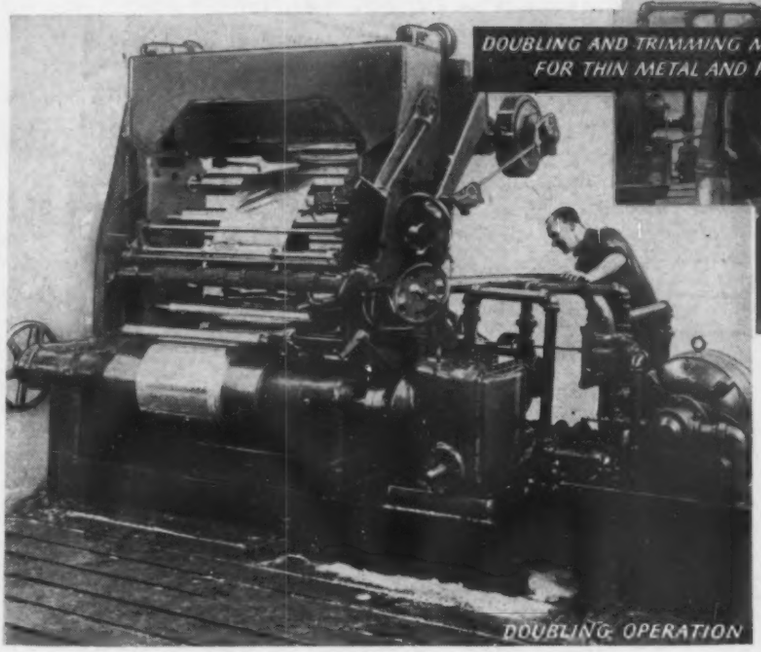

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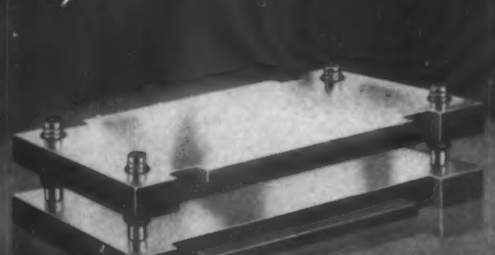
Finely Made Special Die Sets



We are well qualified by experience and well equipped mechanically to produce special die sets of the highest quality. Send us your prints or call the "Detroit" man in your area. We also supply standard die sets in all sizes, and all kinds of accessories.

CALL "DETROIT"

DETROIT	TR 2-5150
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MINNEAPOLIS	AT 5264
PHILADELPHIA	VI 4-4084
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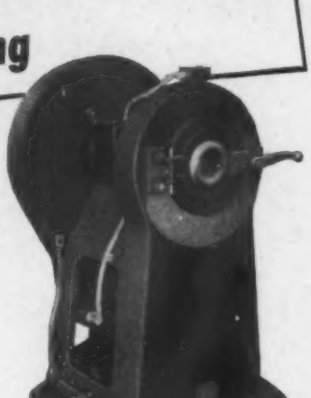
DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. • DETROIT 2, MICHIGAN

DETROIT DIE SETS ★

"Standard" SWAGING MACHINES SHAPE AND JOIN METALS Without Cutting



● In one rapid operation "Standard" Swaging Machines reduce, point, and form tubing or bar stock — without loss of material. They also attach fittings to tubing, wire or cable. Parts swaged are smooth, strong and accurately sized. "Standard" Swagers have many special features for durability and fast, easy operation.

16MM SOUND FILM, 26 minutes, showing principle and applications of Swaging, offered engineering and production groups. Write for available dates.

STANDARD MACHINERY COMPANY
1565 Elmwood Avenue • Providence 7, Rhode Island
MANUFACTURERS OF
Power Presses to 500 Tons • Rolling Mills • Swagers
Turks Heads • Steel Die Sets

STRAIGHT SIDE SINGLE CRANK PRESSES for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.

straight side ress

ZEH & HAHNEMANN CO.
NEWARK N. J.
180 Vanderpool Street

THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

The Torrington Co., Swager Dept.
56 Field Street Torrington, Conn

Here are actual experiences of users of ANTISEP:

IN MICHIGAN:

In centerless grinding of carburized transmission shafts, ANTISEP at 80 to 1 produced a finish of 7 micro inches, beating 13 obtained with former oil. Pieces between wheel dressings increased from 125 to 180. Parts did not rust after grinding.

IN NEW JERSEY:

A bearing manufacturer had complaints on skin troubles. He put ANTISEP in his grinders (100-1 mix) and found within a few weeks that skin irritations had ceased and that machines were clean and free from rancid odors.

IN CALIFORNIA:

ANTISEP was evaluated against two other oils, and was found not only to produce superior finish, but also to eliminate blueing of the metal. An 80-1 ANTISEP mixture beat a 25-1 dilution of the other oils.

IN NEW YORK:

ANTISEP was adopted because it eliminated that "Monday Morning" odor in the shop. Gumming was stopped, machines were clean, and over 11 months there was no rust problem on ground work, even at a 100-1 dilution.

IN ILLINOIS:

A shop used to dress its grinding wheels every 20 pieces; using ANTISEP, it produces 50 pieces between dressings. Operators like the clean, antiseptic odor.

IN OHIO:

From 4 to 6 broaches per wheel was ANTISEP'S improvement in one shop. Wheels stay clean longer, do not burn the work.

•

Plenty more if we had space. To get the whole story, ask the Houghton Man!

If your machine tools could talk . . .

"Listen, boss, I need a spring tonic," they might well say. "For years you've kept me on a diet of soluble cutting oils which have clogged up my system.

"I've got B. O. I'm dirty inside and out. The men who make me work don't like my rancid odor. They complain about 'blued' or burned parts. They claim their skin is irritated by those oils you feed me to cool the work.

"How about a change of oil diet?"

Those machines would brighten up if they had Antisep Soluble Oil in their reservoirs. Here is a new idea in water-soluble cutting oils, capable of greater dilution, and possessing cleansing and sterility features which today rank in importance with tool life and fine finish. Antisep is exclusive with E. F. Houghton & Co., Philadelphia and all principal cities. Try it . . . test it . . . use it!

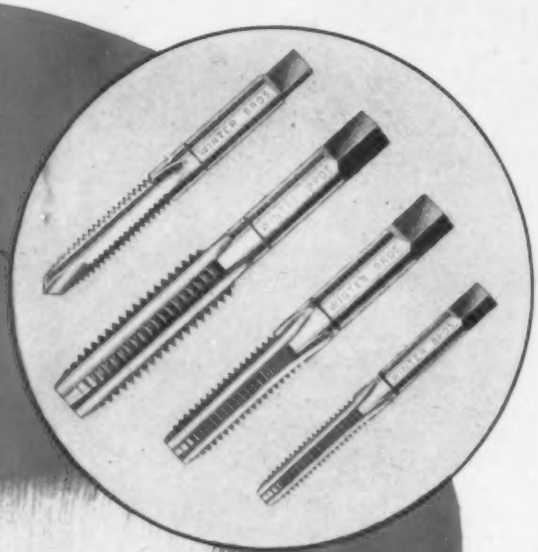
HOUGHTON'S

ANTISEP

SOLUBLE OILS

WHERE ACCURACY

Leadership **BUILDS ON** *Craftsmanship*



Craftsmanship of the highest order always has been employed in the manufacture of WINTER Taps.

WINTER Taps provide the accuracy and speed necessary for economical production. They have that uniformity of quality which insures dependable performance and long life. WINTER Taps are made in a wide variety of styles, including hand, chip driver, machine screw, nut, tapper, pulley, and pipe taps—in high speed or carbon steel. For every thread cutting job, specify WINTER Taps and Dies.

YOUR LOCAL DISTRIBUTOR carries a complete stock of WINTER Taps on his shelves—as close to your tapping problems as the phone on your desk.

Winter Brothers COMPANY

WRENTHAM, MASS. and ROCHESTER, MICH. • Distributors in Principal Cities
A Division of the National Twist Drill and Tool Company • Branch Stores: San Francisco, Chicago, Detroit

AND SPEED COUNT

The skill and facilities to make NATIONAL Tools the best you can buy are supplied at NATIONAL'S great new plant in Rochester, Michigan.

NATIONAL Staggered Tooth Side Milling Cutters are designed for deep slotting operations at higher speeds and feeds. Reduced chatter and ample chip space are made possible by alternating right and left hand spiral teeth. Because side teeth do not have cutting clearance, they tend to maintain the width of the cutter. NATIONAL High Speed Steel Milling Cutters are a part of NATIONAL'S complete line of Rotary Metal Cutting Tools..

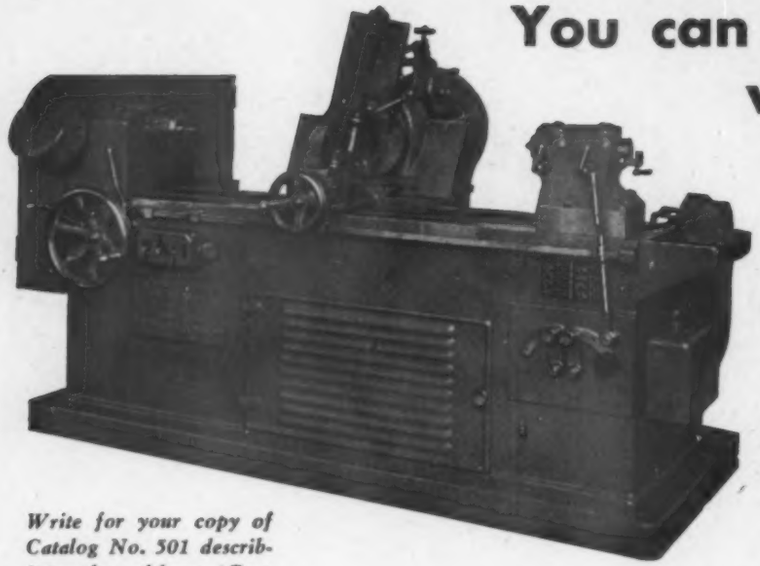
LEADING DISTRIBUTORS EVERYWHERE offer complete stocks of NATIONAL Cutting Tools and factory-trained men to serve you. Call them for cutting tools or any staple industrial product.

NATIONAL TWIST DRILL AND TOOL COMPANY

ROCHESTER, MICHIGAN, U. S. A. Distributors in Principal Cities

Factory Branches: New York • Chicago • Detroit • Cleveland • San Francisco

You can cut set-up time with the ADAMS Gear Hobber and Thread Miller



Write for your copy of Catalog No. 501 describing the Adams Gear Hobber and Thread Miller and the Adams Manufacturing Hobber.

The Adams Gear Hobber and Thread Miller has been designed throughout to reduce all operations to the simplest point consistent with precision production. Setups which frequently consume much valuable time on ordinary machines are handled quickly on the Adams Gear Hobber and Thread Miller. Calculations are easily made on the basis of formulas in the instruction book and the actual setup accomplished in a minimum of time.

Ask for further details

THE ADAMS COMPANY, 1905 Bridge St., Dubuque, Iowa

The ADAMS Company, Dubuque, Iowa, U. S. A.

HOBBER AND THREAD MILLER . . . MANUFACTURING HOBBER . . .

RUGGED

TOWNSEND RIVETERS . . .

GIVE LONG *Trouble-Free* OPERATION

Whether you fasten metal, wood, plastic or fiber, Townsend Riveters will do the job better...CUT ASSEMBLING COSTS... because extra stamina and dependability are built into every machine. Townsend Riveters are so versatile that in many plants, one Townsend Riveter is accomplishing the same range of work formerly handled by three competing riveters.

Write for Monthly Bulletin

THE H. P. TOWNSEND MFG. CO.

2 Chestnut Street • Hartford, Conn.

Manufacturers of Automatic Screw Machines For all Secondary Operations

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"ROCKWELL" HARDNESS TESTER

Made Only by Wilson

• When you invest in a "ROCKWELL" Hardness Tester, we don't know whether it will be used by your Chief Metallurgist or an inexperienced girl in your inspection department. We don't care to know. Because every "ROCKWELL" Tester is made to fill all requirements and to meet all conditions of use.

WILSON MECHANICAL INSTRUMENT CO., INC. ACCO

AN ASSOCIATE COMPANY OF AMERICAN CHAIN & CABLE COMPANY, INC.

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ACCURACY BOOSTS PRODUCTION

No. 1G	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
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ABRASIVE MACHINE TOOL CO.

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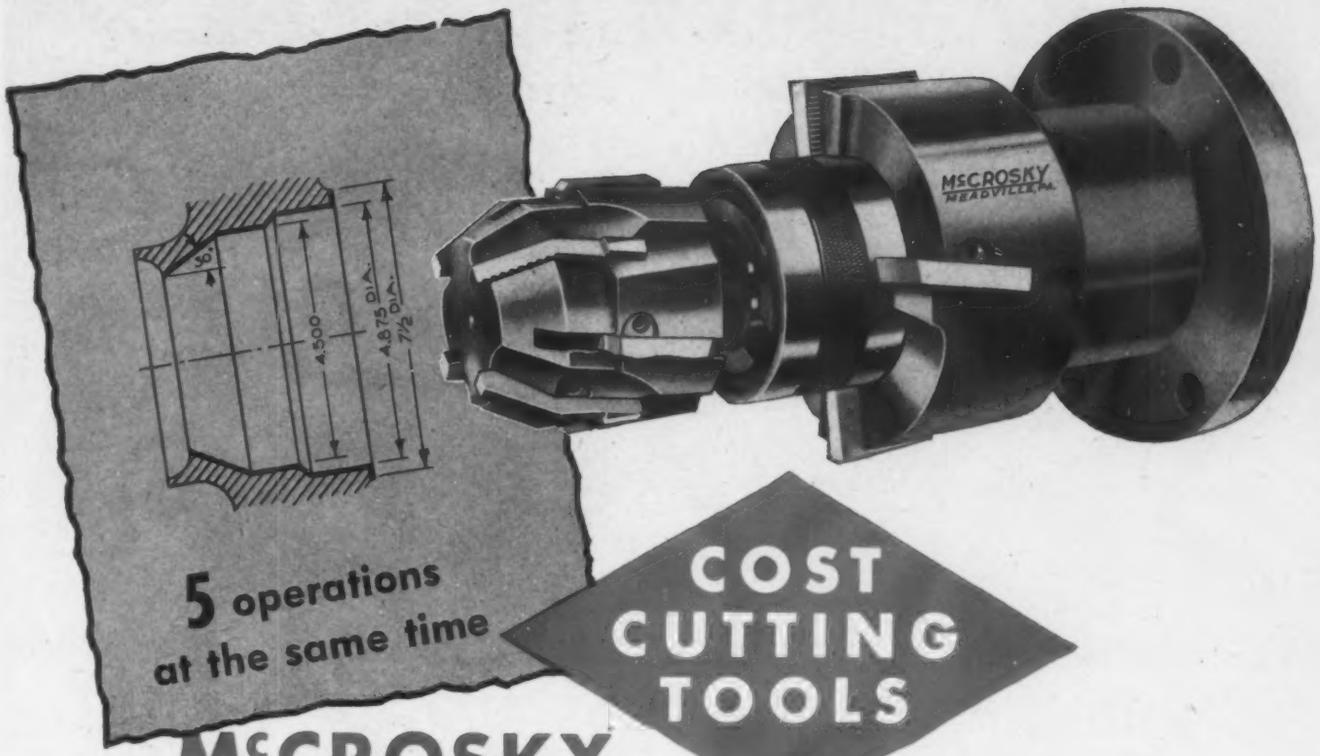


5 operations at the same time

COST CUTTING TOOLS

McCROSKY

Special *Multiple Operation* TOOLS

● Combining 2, 3, 4, 5 or even more boring, facing, chamfering, and reaming operations into a McCrosky Special—and doing them all in just one operation—with just one tool—and just one setup—is the sure, shop-proved way of speeding up production and cutting costs.

Painstakingly engineered to the individual and particular job by McCrosky engineers, "Specials" pay their way on short as well as long production runs. Use of McCrosky's Jack-Lock wedge and other ingenious and exclusive design advantages give these "Specials" the strength and rigidity of solid tools on the job, yet permits easy and quick release of the blades for adjustment, regrinding, or reblading, assuring outstanding efficiency and economy.

Send for Bulletin No. S-17. It illustrates more than 40 applications of McCrosky Specials,— describes the work they do, and may suggest ways you too can use McCrosky Specials to make better products—quicker—and cheaper.

Reduce Machining Time
●
Speed Production
●
Assure Absolute Uniformity and Concentricity of the Finished Work
●
Save Floor Space
●
Cut Costs

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

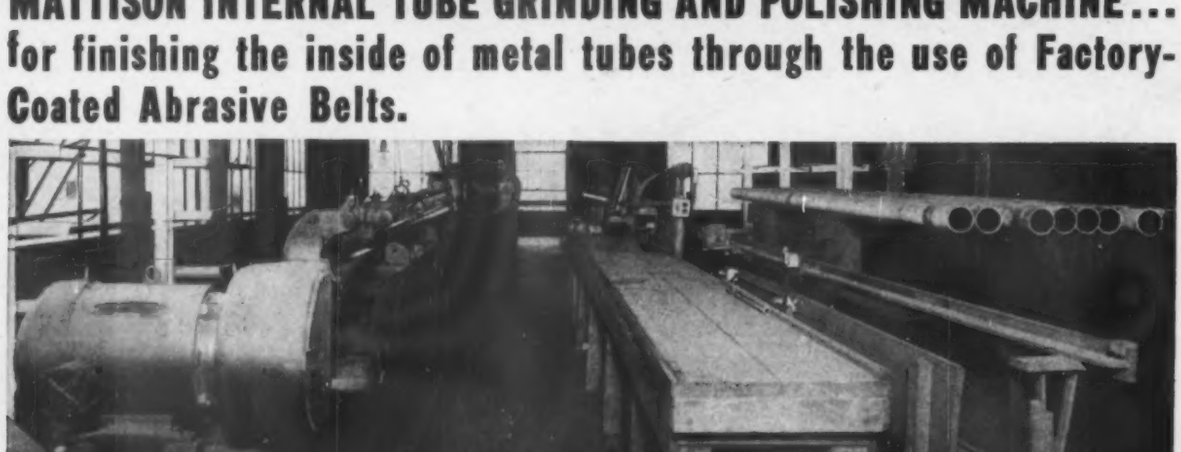
COST CUTTING TOOLS

Designers and Manufacturers of

Jack-Lock Milling Cutters
Super Adjustable Reamers
Block Type Boring Bars
Turret Tool Posts
Wizard Quick-Change Chucks
Special Multiple Operation Tools

MATTISON WIDE BELT GRINDING AND POLISHING MACHINE...
Designed for proper application of Factory-Coated Abrasive Belts to the grinding and polishing of Stainless Steel and Alloy Sheets.

MATTISON INTERNAL TUBE GRINDING AND POLISHING MACHINE...
for finishing the inside of metal tubes through the use of Factory-Coated Abrasive Belts.



From the time factory coated abrasive belts were introduced for metal polishing and grinding, Mattison's have developed and built machines properly applying belts to the job to be done. If your polishing work includes wide sheets or the inside of tubes you will be interested in the capabilities of the two machines shown above.

Separate Circulars are available giving complete information on the machines shown. Write for free copies today.

MATTISON MACHINE WORKS
ROCKFORD · ILLINOIS

prolific perfectionist

The Bryant No. 109 Internal Grinder produces rapidly, automatically and in volume such parts as ball bearing races, gears, rolls and bushings with bore sizes up to 3". It *automatically* rough grinds, trues the wheel, finish grinds and stops when finish size is reached. Bore size is also controlled *automatically* by the wheel trueing diamond or by a plug gaging unit operating through the work spindle. Thus the operator need only load the work, trip the cycle lever and then unload the finished part — often operating two machines with little effort.

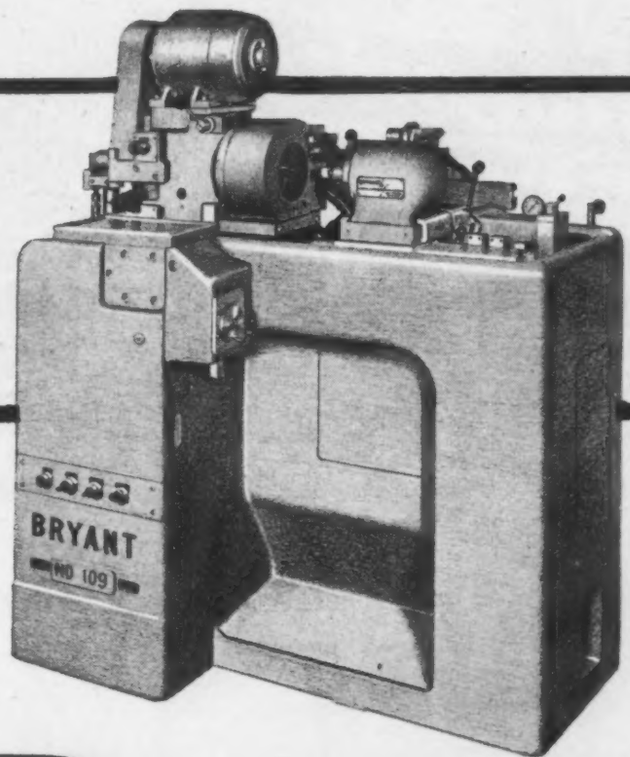
Exclusive Bryant set-up features include split-second cycle control of the wheel-slide through four adjusting throttles. Timing devices for "spark out" are provided for both rough and finish grinding. Hydraulic motors give infinitely variable work speeds and cross feeds. Preloaded ball bearing sealed slides for longitudinal and cross motions give super-smooth control of work and wheel. For proper cutting characteristics on extremely small bores, the Bryant Hi-Frequency Wheelhead offers speeds up to 100,000 r.p.m. Belt-driven spindles are used for the larger range of bore sizes.

The No. 109 is a high production machine, yet grinds bores to the finest tolerances and with work finishes of unbelievable accuracy. For details on this "Prolific Perfectionist," write for catalog.

NUMBER 109

Automatic

INTERNAL GRINDER



Send for the Man from

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

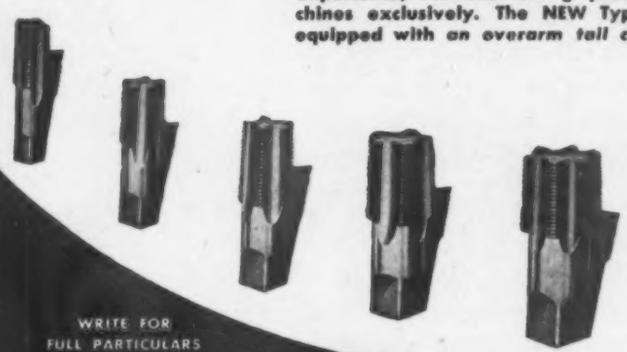
BRYANT

. . . A "REVOLUTION" IN MACHINING INDUSTRY . . .

TOUGH Threading jobs licked by COULTER TYPE "H" THREAD TAP MILLING MACHINE

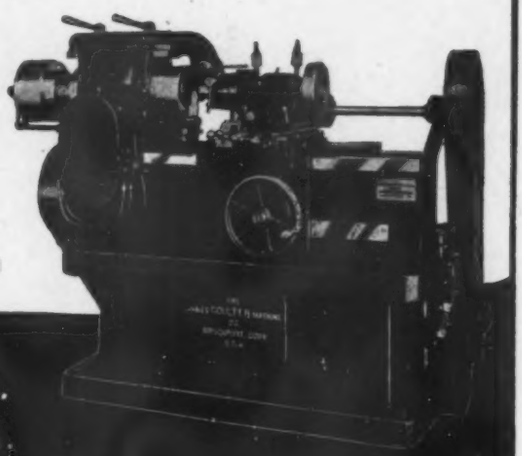
NOW . . . comes a development that extends the capactity of this 'wonder' machine. COULTERS' are made to perform the most delicate threading operation with both speed and accuracy . . . 40 years of specialized experience, manufacturing precision machines exclusively. The NEW Type "H" is equipped with *an overarm tail center and large collet chuck*, holding the work rigidly so *ONLY ONE REVOLUTION OF THE TAP* is necessary.

Any number of FLUTES, eccentric or concentric relief straight or taper can be produced. Pipe taps from ⅛" to 1½" and straight taps from ¼" to 1½"



WRITE FOR FULL PARTICULARS

PRODUCTION MACHINES SINCE 1896



TYPE H

The James **COULTER** *Machine Co.*

BRIDGEPORT • CONNECTICUT • U.S.A.

Tannewitz

The RUGGED-TROUBLE-FREE DI-SAW

Product of more than 50 years of specialization in the manufacture of band sawing machinery the TANNEWITZ 24M is the machine that will enable you to capitalize to the fullest extent on the economies of contour sawing, inside and outside filing and polishing. It's rugged, with every detail of construction thoroughly proved, — TROUBLE-FREE. And it carries full 24-inch wheels which make for easier, straighter sawing. For complete details write for DI-SAW Bulletin.

FRICTION SAWING with Tannewitz High Speed Band Saws offers many amazing advantages. Write for free booklet.

THE TANNEWITZ WORKS
GRAND RAPIDS 4, MICHIGAN

SHELDON

TRB S-56 PRECISION LATHES

TOMORROW'S LATHE FOR SALE TODAY

Just as the S-56 (famous as the wartime's mobile shop and instrument lathe) was well ahead of its time, the new TRB S-56 is definitely a "lathe of tomorrow."

Added to its previous advantages . . . to the same rigid 56" bed, 4-speed V-belt drive with double V belts to spindle, its 1" collet capacity, 1¾" hole through spindle, and modern 5-drawer steel bench are: a new heavier headstock with large tapered roller bearings and a higher speed range, and increased capacity for heavy work.

The new bearings are not just anti-friction but are "Zero Precision"—the absolutely finest taper roller bearings built.

This is more than incidental improvement . . . it means that every Sheldon TRB S-56 can do accurate precision work, at new high machining speed and maintain its extreme accuracy—can produce more and at lower cost per piece.

Write for new TRB S-56 catalog sheet

From any angle this "tomorrow's lathe" is your best buy today.

SHELDON MACHINE CO. Inc.

Manufacturers of Sheldon Precision Lathes • Milling Machines • Shapers

4234 N. KNOX AVENUE • CHICAGO 41, ILLINOIS, U.S.A.

Here Is A Smooth, Sealed, Streamlined Spindle Package...

And Here's Why It Makes Your 6"x18" Surface Grinders Produce More Work And Finer Finishes

Look at the massive construction, the SKF Super-Precision Double Row Roller Bearings and oversize thrust bearings in this Spindle. You'll be quick to appreciate its ability to rough off surplus metal fast and produce finer final finishes.

The *sealed-in* motor delivers a full 1 HP at the wheel. It runs cool, at top efficiency, continuously. Dust, dirt, nuts, bolts and fingers are *sealed out*.

The *sealed-in* bearings likewise operate at top efficiency indefinitely. Lubrication is there to stay. You never have to oil or grease *this* spindle, and it won't run dry.

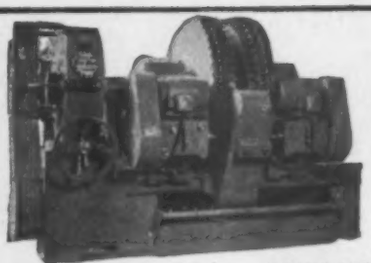
Put in one of these Spindles and let its performance speak for itself.

Data Sheet No. 12 gives you the story on application to *your* grinders. May we mail you a copy?

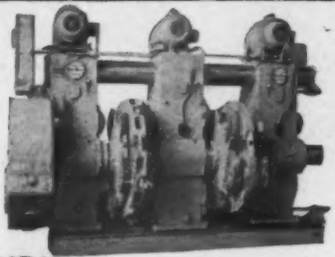
POPE MACHINERY CORPORATION
ESTABLISHED 1920
261 RIVER ST. • HAVERHILL, MASS.

No. 43

POPE Completely Sealed MOTORIZED SPINDLE

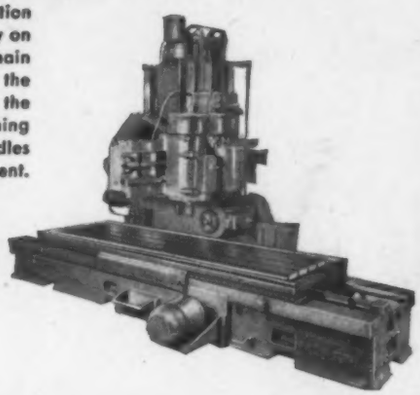


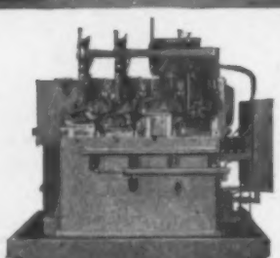
Roto-Matic MILLERS

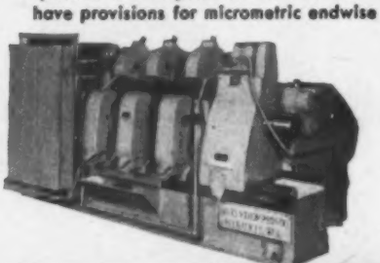


ROTARY DRUM TYPES •
VERTICALS • SINGLE AND MULTIPLE SPINDLES
PLANERS • RISE AND FALL • VERTICAL INDEXING

The ROTO-MATIC principle of continuous production insures the maximum of production and accuracy on any job to which a Miller has been adapted. Chain clamping mechanisms, where adapted, leave the operator free to load and unload parts. On the larger type Rotary Drum Type Millers finishing spindles are adjustable for toe cut. All spindles have provisions for micrometric endwise adjustment.







MILLING • DRILLING • REAMING • BORING • PIPE THREADING • SPECIAL MACHINES

DAVIS & THOMPSON COMPANY

MANUFACTURERS MACHINE TOOLS, MICROMETERS AND GAGES

MILWAUKEE WISCONSIN

THE AMAZING SOFT FACE HAMMER TIP

Practically Indestructible

Only the Nuplaflex tip—a remarkable "live" material, can "take" such brutal punishment—*un*harmed. No wonder, then, that Nupla Hammers—

- OUTLAST BY FAR OTHER SOFT FACE HAMMERS
- NEVER LOSE THEIR SHAPE
- WON'T CHIP OR CRACK

Crush it in a vise. Watch it slowly, magically, return to its original shape.

BUT THAT'S NOT ALL . . . Nupla Hammers won't rebound or sting—are less tiring to use . . . won't harm surfaces, yet provide *maximum* impact . . . are safer—tips are chip-proof, non-explosive, won't flash burn; sleeves, spark-proof.

Nupla Hammers, with Nuplaflex tips, available in 16 sizes, weights. Ask your supplier or write Dept. AM5.

Nupla SOFT FACE hammer

New Plastic Corporation, 1017 N. Sycamore Ave., Los Angeles 38, Calif.

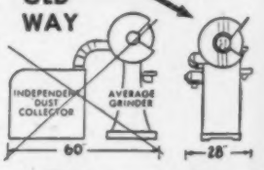
Hammond of KALAMAZOO

NO DUST GRINDER

"BUILT-IN" FEATURE

SAVE OVER 50% FLOOR SPACE THE HAMMOND WAY

OLD WAY

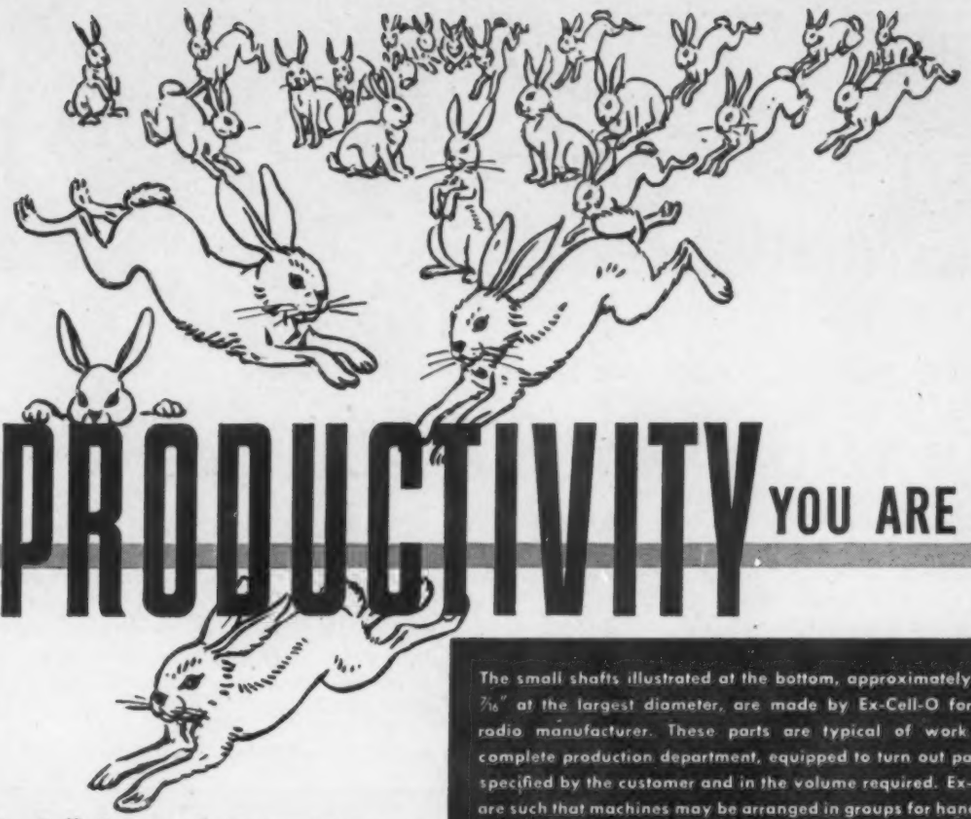


- Requires only 6½ square feet.
- Protects employees' health.
- Protects nearby machine tools against excessive wear from dust and grit.

A self-contained Grinder and Dust Collector for 10", 12" and 14" wheels. Write for Bulletin No. 104.

Hammond Machinery Builders INC

1618 DOUGLAS AVENUE • KALAMAZOO 54, MICHIGAN



IF IT'S PRODUCTIVITY YOU ARE AFTER

Consider Ex-Cell-O . . . where parts production is keyed to *your* exact requirements

The long years of engineering experience . . . the modern and complete facilities . . . the manufacturing "know how" . . . that have made Ex-Cell-O an outstanding name in the metal-working industry . . . can help you solve your problem if you are in need of accurate parts and sub-assemblies for your product, whether old or new. Ex-Cell-O, *with machining, heat-treating, grinding and sub-assembling facilities all under one management,* offers you many practical advantages. Send your print or part to Ex-Cell-O in Detroit today, or get in touch with any member of Ex-Cell-O's field engineering staff in thirty-two leading industrial centers in the United States and Canada.

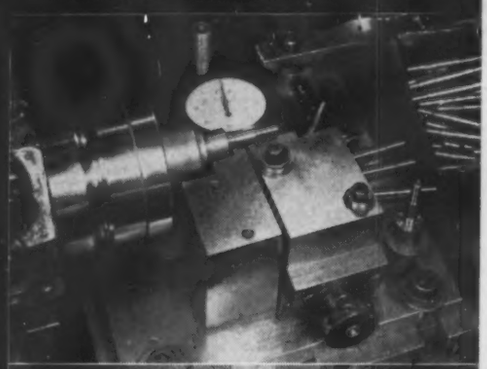
XLO
EX-CELL-O for PRECISION

Modern machine tools mean *"more goods for more people at lower prices"* . . . see 1947 Machine Tool Show in Chicago in September!

The small shafts illustrated at the bottom, approximately 3½" long and 7/16" at the largest diameter, are made by Ex-Cell-O for a well-known radio manufacturer. These parts are typical of work in Ex-Cell-O's complete production department, equipped to turn out parts to the limits specified by the customer and in the volume required. Ex-Cell-O facilities are such that machines may be arranged in groups for handling successive operations in the most efficient and economical manner.

★

To right: Grooving radio shafts on Ex-Cell-O Precision Boring Machine. Widths of grooves are held within .004" and distance between grooves is held within .005".



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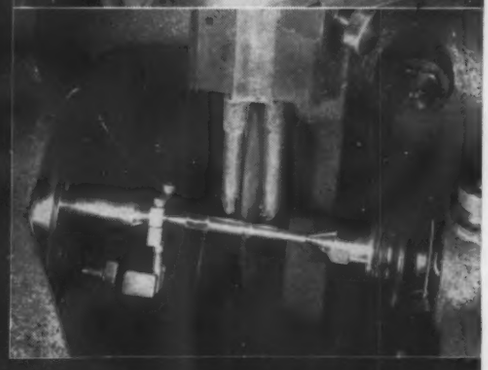
To right: On an Ex-Cell-O Style 33 Precision Thread Grinder a 3/8-20 thread is ground on the parts after they have been hardened.



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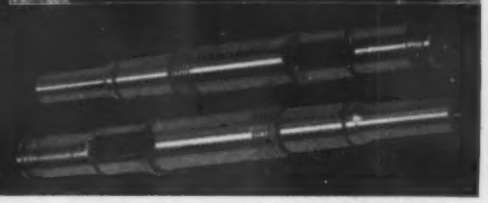
To right: Hardened and ground precision radio shafts, referred to above, made in Ex-Cell-O's Parts Production Department.

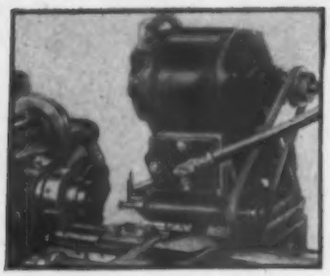


47—3

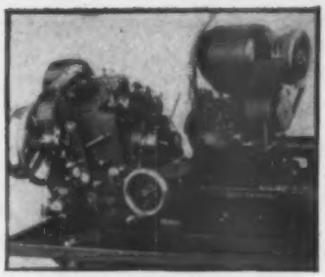
EX-CELL-O CORPORATION

DETROIT 6
MICHIGAN

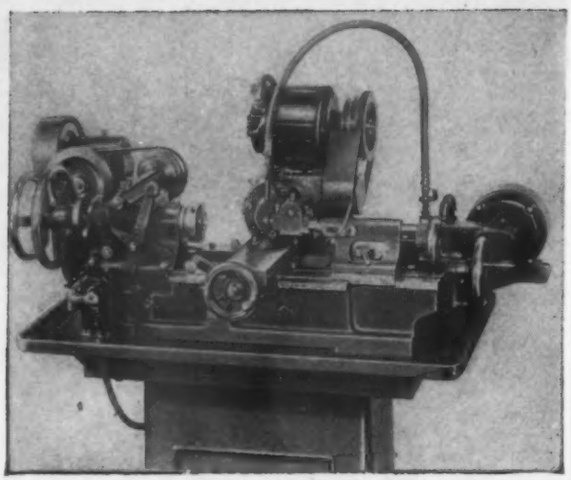
MANUFACTURERS OF PRECISION MACHINE TOOLS AND CUTTING TOOLS • PRODUCTION PARTS AND SUB-ASSEMBLIES



Machine equipped with Internal Milling Attachment



Machine equipped with Relieving Head



ALL STANDARD FORMS OF THREADS CAN BE PRODUCED TO CLOSEST TOLERANCES ON

WALTHAM THREAD MILLERS

Three motors on these machines provide a wide flexibility in operation as well as a constant supply of coolant for all requirements. By simply changing ratios, speeds are suitable for cutting either brass or steel. Waltham can furnish cutters for any thread form desired.

Machines are mounted on cabinet base with two shelves inside. Standard equipment includes: three motors with push button start and automatic or push button stop—follow rest—one milling cutter—indexing device for cutting multiple threads—5 pitch lead screw—change gears for cutting from 5 to 40 threads per inch.

Special Equipment Extends Utility

Extra equipment includes: a special work head for relieving—a special motor driven cutter head for internal threading—a multiple cutter threading attachment—automatic cam operation—special tailstock for multiple cutter work—translating gears for cutting metric threads—metric lead screw—plain taper attachment.

Write for Bulletin 244A giving detailed information.

WALTHAM MACHINE WORKS

WALTHAM, MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.

Grand Rapids No. 55 Surface Grinder

Faster precision production is possible with the exceptional table speed of Grand Rapids Hydraulic Feed Surface Grinders. Both longitudinal table travel and cross feed are automatic, hydraulic. Wheel head is powered for rapid vertical travel.

Write for Bulletin GL-101

GALLMEYER & LIVINGSTON COMPANY

Manufacturers of Grand Rapids Grinders

330 STRAIGHT ST., S. W., GRAND RAPIDS 4, MICH.

These are the NEW

DUBLIFE Plug Gages with

COLORED *Plastic* (INSULATING) COLLETS

GREEN for "GO"

RED for "NO GO"

REVERSIBLE

Colored Collets identify plug instantly. Weight is reduced. Plugs securely locked without marring or scratching plugs as with metal collets.

New Light Weight Handle with these collets.

DUBLIFE

In one and same balanced handle, 2 "GO" and 2 "NO GO" Plugs. Tolerances to .00002. Reverse either plug when wear shows and you have a new, fresh gage. Time saving! Gage saving! Money saving! It is to your advantage to know about DUBLIFE GAGES with colored plastic collets and light weight handles. Send for complete catalog showing DUBLIFE and A. G. Design Gages.

Ask for Catalog "G"

UNITED PRECISION PRODUCTS CO.

SHABBONA, ILLINOIS

NU-SAL AND THERMO-QUENCH . . . two Park *laboratory controlled* heat-treating salts that make an unbeatable team on interrupted quenching operations!

Nu-Sal, you know, possesses unusually high thermal-conductivity. It provides rapid, uniform heating that assures consistently good results and its working range covers the hardening temperatures of most commonly used steels. In addition, you'll find that Park Nu-Sal forms an exceptionally fluid austenitizing bath of great fluidity and miscibility.

Thermo-Quench is a more recent Park development made especially for interrupted quenching, transformation and tempering operations. It has a low melting point . . . 305°F. . . . and it forms an extremely fluid bath that provides desirable cooling rates through the critical zone.

For specific application recommendations on these and other Park laboratory controlled heat-treating products, consult your nearest Park Service Representative or send us full particulars direct.

• Liquid and Solid Carburizers • Cyanide, Neutral, and High Speed Steel Salts • Coke • Lead Pot Carbon • Charcoal • No Carb • Carbon Preventer • Quenching and Tempering Oils • Drawing Salts • Metal Cleaners • Kold-Grip Polishing Wheel Cement

LICENSED MANUFACTURERS: Electric Resistance Furnace Co., Ltd., Weybridge, Surrey, England

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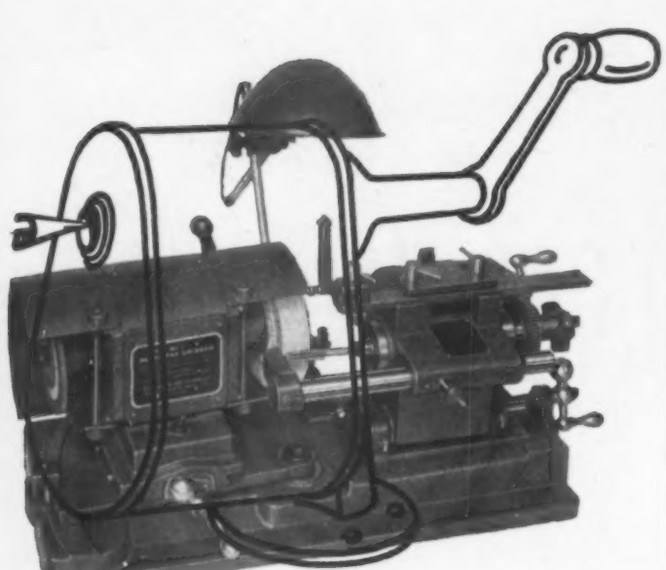
Easy as sharpening a pencil!



- **THE BLAKE TAP GRINDER**
- **. . . the *EASIEST-TO-USE***
- **. . . the *MOST ACCURATE*, and**
- **. . . the *FASTEST SHARPENING***

TAP GRINDER THAT MONEY CAN BUY

Please send me a free copy of Bulletin which gives complete details on the Blake Tap Grinder. A.M.

Name ..... Title .....

Company .....

Street .....

City ..... State .....

BLAKE TAP GRINDERS—FILTAIRE PORTABLE DUST COLLECTORS—AMERICAN TOOL HOLDERS—BLACK DIAMOND PRECISION DRILL GRINDERS—WALTHAM CUTTER SHARPENERS

Investigate

THE POSSIBILITIES OF THE NATIONAL KEYSEATING MILLER *on Your Work*

Several widths of cutters can be used with each size miller and many different hole diameters keyseated with one tool through the use of eccentric bushings.

• Shops all over the country are solving difficult keyseating problems by chucking this attachment on their drill presses, radials and horizontal boring mills—and milling keyseats in pieces too large or bulky for convenient handling on keyseating machines.

The "National" goes through the hole once and mills keyseats with parallel sides and parallel with the axis of the bore. It's a big time and money saver and is available in standard stock diameters from ½" to 3½" for cutting lengths from 1⅞" to 12". It will keyseat in blind holes, and offset holes. We also manufacture oil-grooving millers.

WRITE today for Catalog No. 16

NATIONAL MACHINE TOOL CO.
CINCINNATI, OHIO

GRANT

RIVETERS — PIONEERS in their line—head rivets from smallest to ⅝" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

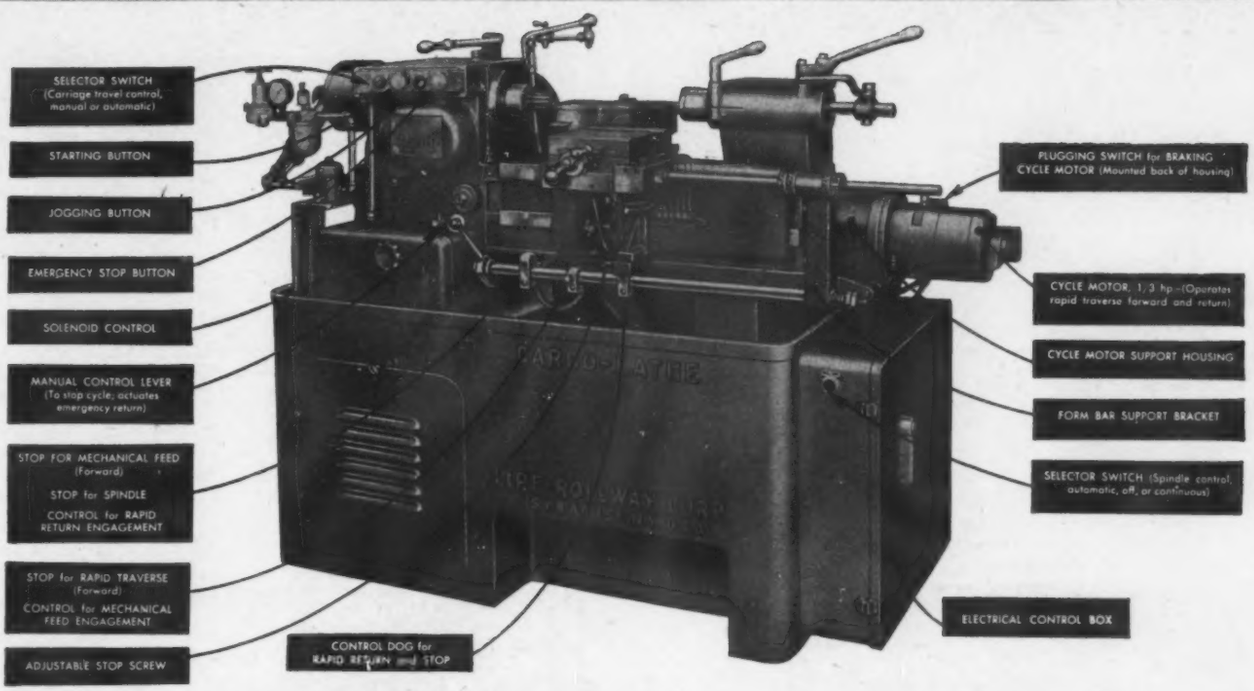
For Faster Smoother Cleaner Grinding
ECONOMY
W&B

Grinding and Cutting Oils and Lubricants for Every Metal Working Purpose

THE WHITE & BAGLEY COMPANY
WORCESTER, MASS. • DETROIT, MICH.

COMPLETE CYCLE ELECTRICALLY CONTROLLED

STEPS-UP PRODUCTION! REDUCES FATIGUE!


SELECTOR SWITCH (Carriage travel control, manual or automatic)
STARTING BUTTON
JOGGING BUTTON
EMERGENCY STOP BUTTON
SOLENOID CONTROL
MANUAL CONTROL LEVER (To stop cycle; actuates emergency return)
STOP FOR MECHANICAL FEED (Forward)
STOP for SPINDLE
CONTROL for RAPID RETURN ENGAGEMENT
STOP for RAPID TRAVERSE (Forward)
CONTROL for MECHANICAL FEED ENGAGEMENT
ADJUSTABLE STOP SCREW
CONTROL DOG for RAPID RETURN and STOP
PLUGGING SWITCH for BRAKING CYCLE MOTOR (Mounted back of housing)
CYCLE MOTOR, 1/3 hp.—(Operates rapid traverse forward and return)
CYCLE MOTOR SUPPORT HOUSING
FORM BAR SUPPORT BRACKET
SELECTOR SWITCH (Spindle control, automatic, off, or continuous)
ELECTRICAL CONTROL BOX

LIPE *Carbo-Lathes*

For fast, simple operation, just push the starting button . . . Instantly the spindle starts, the carriage moves rapidly up to the cutting position, and the mechanical feed engages automatically.

At the end of the feed cut, the mechanical feed disengages and the carriage stops for predetermined length of time to allow tools to clear themselves. At the precise moment, the spindle stops and the carriage returns quickly to the loading position, all ready for the next operation.

GET MORE PRODUCTION FROM YOUR PRESENT LIPE CARBO-LATHES

LIPE Automatic Complete Cycle Attachment may be used on any LIPE Carbo-Lathe bearing a serial number of 200 or more, and may be used on either plain or taper turning type front carriage.

See Your LIPE Distributor for Full Money-Making Details

Your operator always has control. With the manual control, he can disengage and re-engage feed . . . stop spindle . . . return carriage at any point in the operation.

The selector switch permits continuous operation of the spindle. The push button or remote limit switch starts feed at the beginning of cycle. Complete change of set-up can be made in just a few seconds by moving only three adjustable stops.

NOTE: Lipe Carbo-Lathes are sold with or without Complete Cycle Attachment.

LIPE ROLLWAY

Lipe-ROLLWAY CORPORATION • SYRACUSE 1, N. Y., U.S.A.

Cable Address: LIPEGEAR

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OD-9 CYLINDRICAL FINISHING MACHINE

For Faster, Better Finishing of Tubes, Rods, Bars and a Wide Variety of Cylindrical Shapes.

CENTERLESS No holding or chucking.

VERSATILE Uses abrasive belts or polishing and buffing wheels.

FAST UP to 30′ per minute.

For plunge cut or through feed. Idler roll fixtures as shown for long work. Send samples for detailed engineering report . . . no obligation.

See Hammond Equipment In Operation at Booths 65, 66, 67 and 68 at the Industrial Finishing Exposition, Detroit, June 23-27.

Hammond Machinery Builders INC.

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REED-PRENTICE

LATHES
DIE CASTERS
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VERTICAL MILLERS
INJECTION MOLDERS

REED PRENTICE CORP.

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
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Saginaw, Michigan

HOLMAN BETTER, FASTER HOLE FINISHING

HELICAL
TAPER PIN
REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

HOLMAN REAMER CO.
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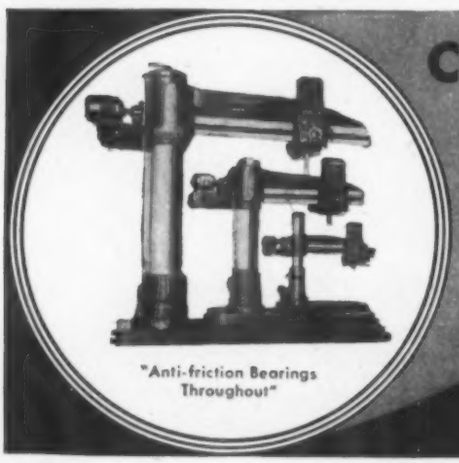


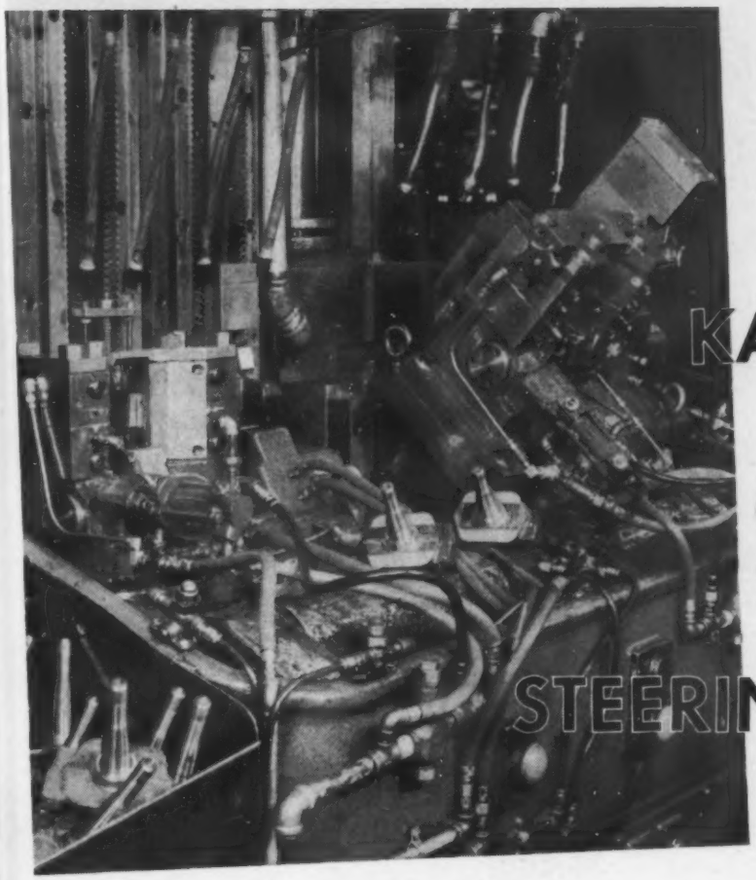
"Anti-friction Bearings Throughout"

CARLTON RADIAL DRILL

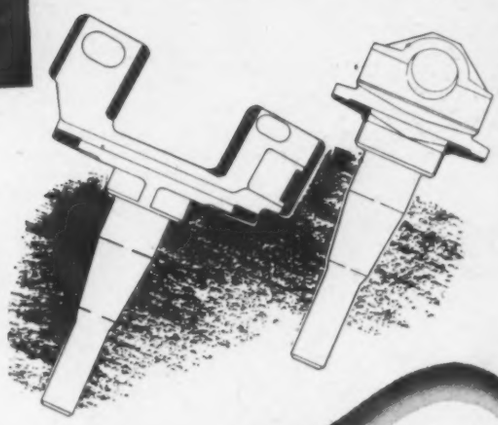
FEATURES: 1. Low Hung Drive to Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all Speeds. 4. Concentrated and Convenient Push-button Controls. 5. Constructed on Unit Principle.

THE CARLTON MACHINE TOOL COMPANY

CINCINNATI 25, OHIO, U. S. A.



MICHIGAN TOOLED KAISER-FRAZER FOR *Complete Broaching* OF THIS STEERING KNUCKLE



Broaches, Broach Holders and Pneumatic Fixtures were designed, built and followed in Production by Michigan

Illustrated is one of 4 machines equipped by Michigan. Shows dual ram set up with pneumatic fixture at left in operative position, fixture at right in loading position. 16 surfaces and the king pin hole are broached to final finish in five passes.

What makes this a story? Just that Michigan can do the same for you—start with the part print and machine and place the job in production.

Let Michigan quote on your next job

MICHIGAN WILL *also* DO THE COMPLETE MACHINING OF YOUR PARTS

Michigan is also equipped with the largest machine shop of its kind to machine and broach production parts for you.

MICHIGAN BROACH CO.

10373 NORTHLAWN AVENUE • • • DETROIT 4, MICHIGAN

YES, you can save up to 20% on a brand new set of Ellstrom Chromium-plated Gage Blocks simply by trading in your worn set under Ellstrom's liberal exchange plan. Here's how it works . . .

(1) If you have a used set of rectangular Ellstrom blocks, you get a 20% trade-in allowance on a brand new duplicate set.

(2) On worn rectangular blocks of any other make, you get a 10% trade-in allowance.

(3) Used sets of square type blocks bring you a 10% trade-in allowance regardless of make.

(4) Or, if you have any number of individual blocks in need of replacement, the same discounts will be allowed on the price of replacement.

NOTE: All discounts are based on existing W prices.

Under this liberal exchange plan, you can keep your old blocks until we deliver your new ones—each having the inimitable Ellstrom feature of Chromium plated gaging surfaces to assure you of longer wearing millionths!

Write today for latest Ellstrom prices and delivery schedules.

DEARBORN GAGE CO. 22035 BEECH STREET DEARBORN, MICHIGAN

Originators of Chromium Plated Gage Blocks

Chromium plated gage blocks

now available

in sizes as low as .020 of an inch

Rust is a costly, ever-present production problem wherever ferrous metals are used. You can now eliminate this destructive force inexpensively and surely. NO-RUST, perfected by Frost Paint & Oil Corporation, is the scientific answer to this problem. NO-RUST is a liquid which can be sprayed, or brushed. It dries almost instantly to a flint-line hardness that will not chip or crack. Despite this durable finish, it can be easily wiped off with kerosene or distillate.

NO-RUST IS THE INEXPENSIVE ANSWER TO AN EXPENSIVE PROBLEM

Greases, oils, and other substances may seem to cost less, but in the final analysis NO-RUST, because of its *sure* protection, is the most inexpensive rust preventative you can buy. Why hazard expensive machined parts or costly tools by using questionable rust prevention. Be positive! Use the one and only NO-RUST.

● Write today for a free sample of NO-RUST. It can be the solution to one of your biggest production problems.

IF YOU HAVE OTHER PROBLEMS RELATING TO PROTECTIVE FINISHES, TELL US ABOUT THEM. WE CAN SUPPLY THE ANSWER.

Frost PAINT AND OIL CORPORATION

MINNEAPOLIS 13, MINNESOTA

IT LOOKED LIKE AN ACORN

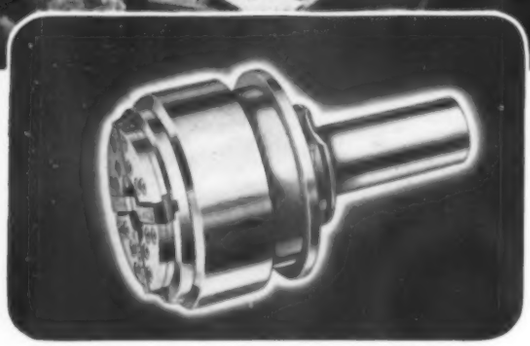
The year was 1909. Throughout the nation, hundreds of new factories were trying to meet the swelling clamor for automobiles, sewing machines, telephones, and a score of other "new-fangled gadgets". There was a need for automatic machines and high-speed methods of production —and a new type of threading die for machine use. GTD "Greenfield" met this need with the "Acorn" Die. Almost overnight it revolutionized machine threading. Its unique design made it possible to produce precision threads at high speeds. Through the years there have been refinements to its original design, but the "Acorn" Die is today still the standard for accurate, high speed threading on automatic machines.

GTD Greenfield 75th YEAR

The "Acorn" Die, so-called because its shape is similar to that of an acorn, consists of prongs of threaded metal projecting from a circular metal base. This is supported in a "holder" which, in turn, fits into the chuck on the machine. The "Acorn" Die is known and used wherever modern screw threading methods are employed.

GREENFIELD TAP and DIE CORPORATION
Greenfield · Massachusetts

The GEOMETRIC TOOL COMPANY
New Haven, Connecticut · In Its Fifty-Fourth Year
A DIVISION OF GREENFIELD TAP and DIE CORPORATION



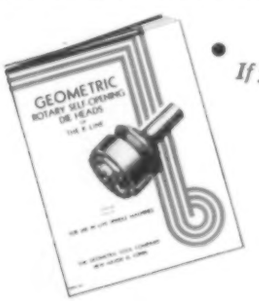
"GEOMETRIC" ROTARY DIE HEAD — STYLE KD . . . Its rugged simplicity, compactness, positive tripping and resetting insure a long period of service. KD Die Heads cut threads from $\frac{1}{16}$" diameter to 2".

Backing GEOMETRIC Threading Tools . . .

Precision in threading tools can be achieved only through adherence to high manufacturing standards and vigilant attention to every detail. The finished perfection of Geometric Die Heads, Collapsing Taps and Chasers results from the skilled care which attends each step in the production of these tools.

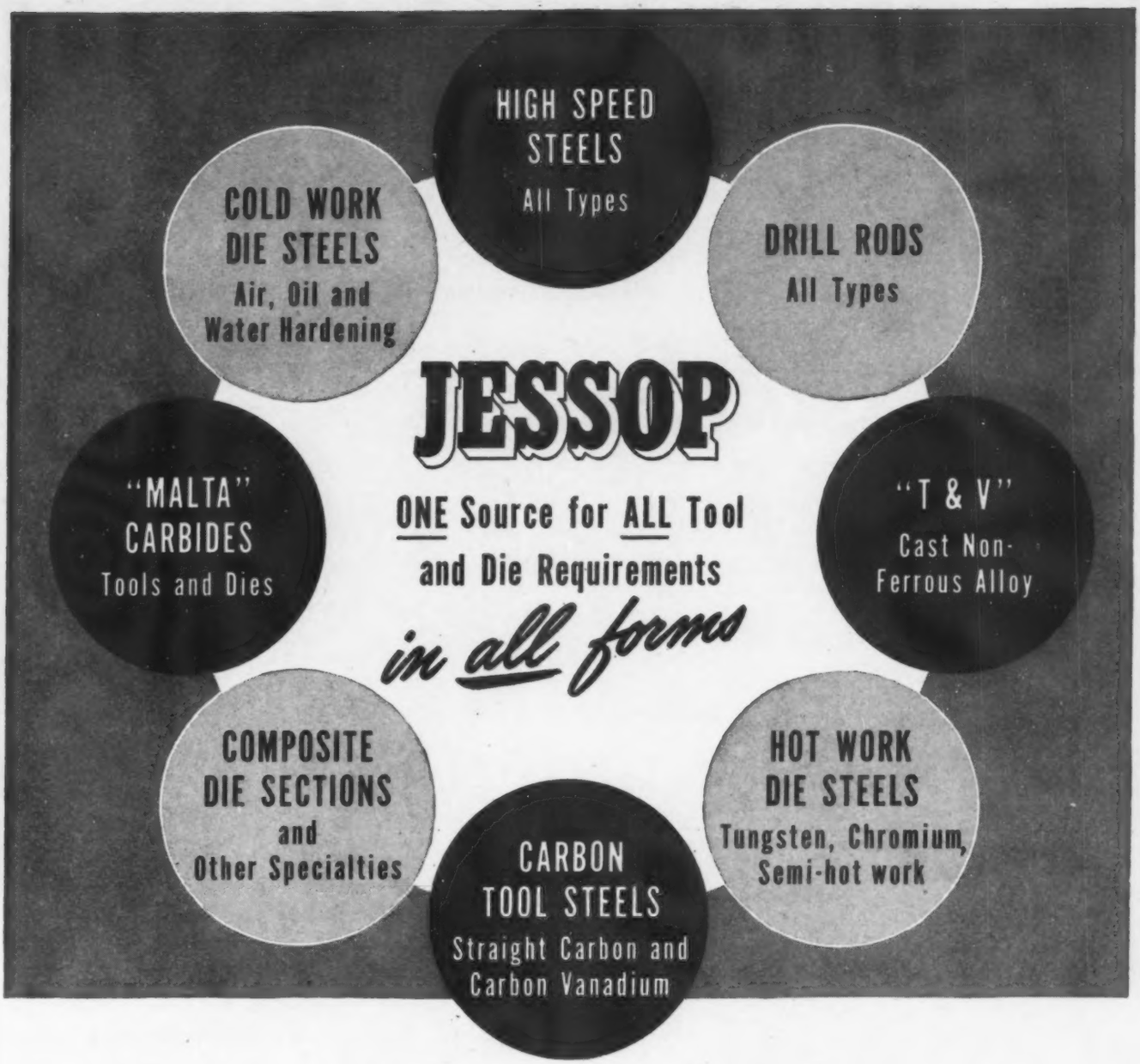
Here is a part of the modern Assembly Department in the Geometric plant in New Haven.

These highly trained men are proud of their share in the production of fine tools. Whether assembling standard types of threading tools or a special tool for an unusual job, they spare no effort to guarantee the best possible tool for each and every job.



If you would like to learn more about Geometric Style KD Rotary Die Heads, write today for FREE 8-page bulletin #K-3 which describes this tool in detail. This bulletin is illustrated and lists complete KD Die Head specifications.

THE
GEOMETRIC
TOOL COMPANY · NEW HAVEN 15, CONN.
A Division of Greenfield Tap and Die Corporation



Rolled • Forged • CAST-TO-SHAPE • Cold Drawn

JESSOP'S diversified line of products enables us to furnish the best product for your applications in tool and die materials.

The most efficient way to meet your requirements for tool and die materials is to call in the nearest JESSOP representative and outline your problem in detail. Since JESSOP makes *all* types of tool and die steels, as well as carbides and cast non-ferrous alloys, the Jessop Service Engineer can make sound, unbiased recommendations as to the type best suited to your particular needs.

JESSOP STEEL COMPANY

WASHINGTON, PENNSYLVANIA

Tailor-made Specialty Steels

Goss & DeLeeuw

MACHINE COMPANY

KENSINGTON, • CONN.

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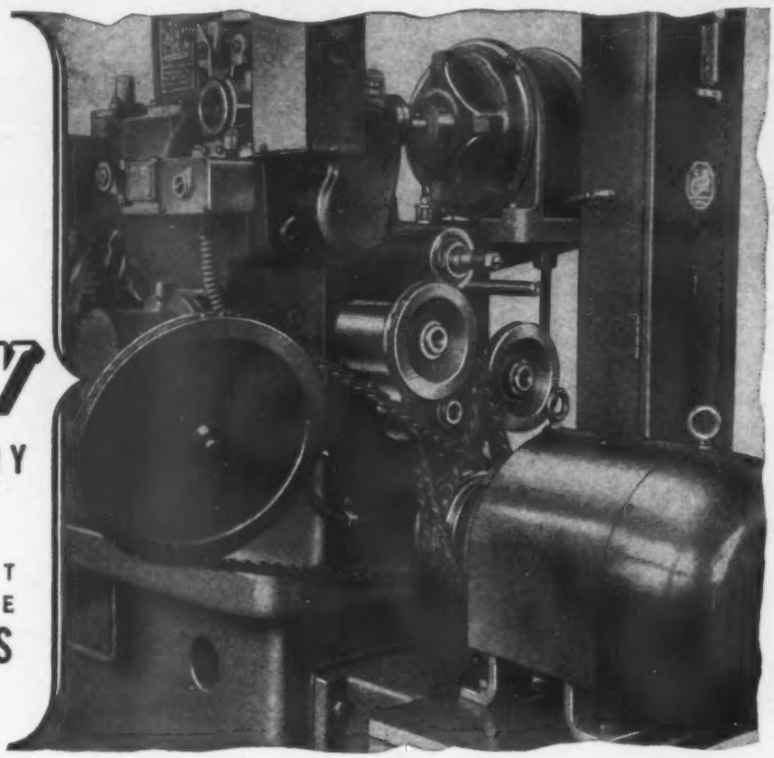
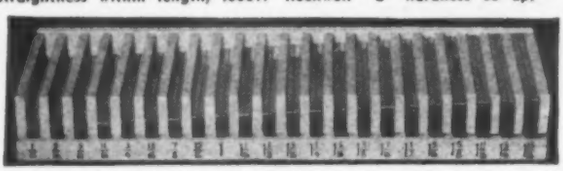
THE WORLD'S FINEST
MULTIPLE SPINDLE
CHUCKING MACHINES



ANTON PARALLELS

INCREASE PRODUCTION IMPROVE QUALITY USE ANTON PARALLELS ANTON PARALLELS FILL A LONG-FELT NEED—Permanently straight and accurate, yet priced for general machine shop use. All fully guaranteed to be within the limits specified. Maximum size tolerance .001 inch on ground sides. Maximum variation in parallelism and straightness within length, .0001. Rockwell "C" hardness 65 up.



Price per set includes a handy Wooden Container. Large Stock of Single Pairs also Available. All Prices are F.O.B. New York

ANTON MACHINE WORKS

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HARDNESS TESTER

The *Scleroscope* is the only hardness tester that takes in the entire range from the softest to the hardest metals without any adjustments.

MODEL D-1 DIAL TYPE

Write for Circular!

THE SHORE INSTRUMENT & MANUFACTURING CO., INC.

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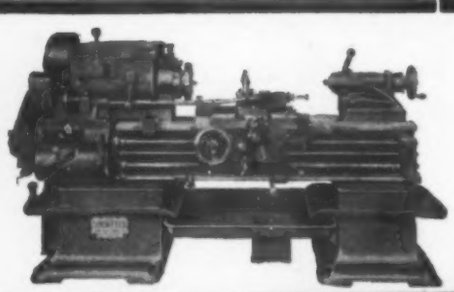
JAMAICA, NEW YORK

TELEPHONE: JAMAICA 6-4098

SPRINGFIELD GEARED HEAD LATHES



. . . versatile, efficient!

Springfield designs lathes to retain accuracy and speed over long periods of use. For quantity production or special use they're economical and extremely adaptable. Sizes available range from 14" to 30". *Write for descriptive bulletins, prices and deliveries.*

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U.S.A.

With **SUNNEN PRECISION HONING**
You Can Produce Holes with

Accuracy to .0001"
at Low Cost

Used on thousands of parts such as the examples shown here, the Sunnen Precision Honing Machine finishes parts quickly and more accurately than any other method. As a result parts last longer and there are fewer rejects — even when tolerances are as close as 1 to 2 ten thousandths.

Sunnen Precision Honing produces holes that are straight and true; corrects errors of taper and out-of-roundness; align-hones two or more holes of the same size; accurately duplicates sizes.

To hold very close tolerances on those "difficult" jobs — or produce better than usual finishes — the Sunnen Precision Honing Machine will do the job rapidly and economically.

For complete details write for Bulletin XMAN 5000, or ask a Sunnen engineer to call and show you how Sunnen Honing can be used in your plant.

- Size range—.120" to 2.625" in diameter.
- Operates in any metal or plastic except lead and babbitt.
- Set it up in one minute — easy to use.
- Low in cost — economical to operate.
- No jigs or fixtures needed — no chucking distortion.
- Does not require skilled labor.

SUNNEN PRODUCTS COMPANY
7941 Manchester Ave • St. Louis 17, Mo.
Canadian Factory: Chatham, Ontario

SUNNEN

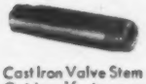
205

The Sunnen Precision Honing Machine is used on parts like these . . .

Shell Loading Die.

Carbureter Idler Pump. Smooth, straight-line finish in blind hole prevents piston leakage.

Aircraft Instrument Panel Control Wire Bushing. Hole .187" diameter—held to .0002", stock removal .001", sixty per hour.


Cast Iron Valve Stem Guide. ½ to one thousandth removed — 220 pieces per hour. Better finish and straighter hole.

Hydraulic Control Bushing. Honing gives straight round hole after rough reaming.

Bearing. A very small part. 2 micro-inch finish necessary.

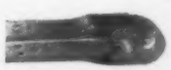
Aircraft Hydraulic Brake Cylinder. Honing 3 times faster than lapping — and gave a straighter hole.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Compressor Yoke. Alignment maintained and better finish produced.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Drawing and Blanking Die "Saves time in producing smooth base metal finish."


Mild Steel Clevis. Honing corrected errors of previous operations and maintained true alignment of two holes.

Miniature aircraft cylinder — smooth, accurate honing provides better compression and longer life.

Automobile Distributor Shaft Gears. Taper removed at a rate of 80-90 per hour.

Now..

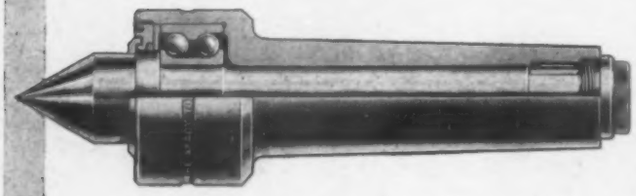
YOU CAN SPECIFY

RED-E

AND SAVE ON CENTER COSTS, TOO!

SHANK TYPE

Light series. Preloaded ball bearings. Replaceable high speed steel points. Smooth, sustained accuracy.



BALL AND ROLLER BEARING TYPE

Heavy duty series. Preloaded ball bearings in head . . . roller bearings in shank. Accuracy at high speeds, heavy feeds.

At new low costs, RED-E Standard Ball Bearing Centers — designed and built by engineers who thoroughly understand center requirements — are available to meet the majority of applications where high speed steel cutting tools are used. New Departure double row preloaded ball bearings assure accurate performance, longer life under continuous operation. Priced to mean real savings!

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HEX OR SQUARE Collets needed for that new job? Then say "*PRECISION Collets, please!*" to your industrial distributor. You'll get them now when you want them . . . from stock. And you'll get them as you want them . . . ground dead true, with a spring temper that spells assured performance, and with long life guaranteed.

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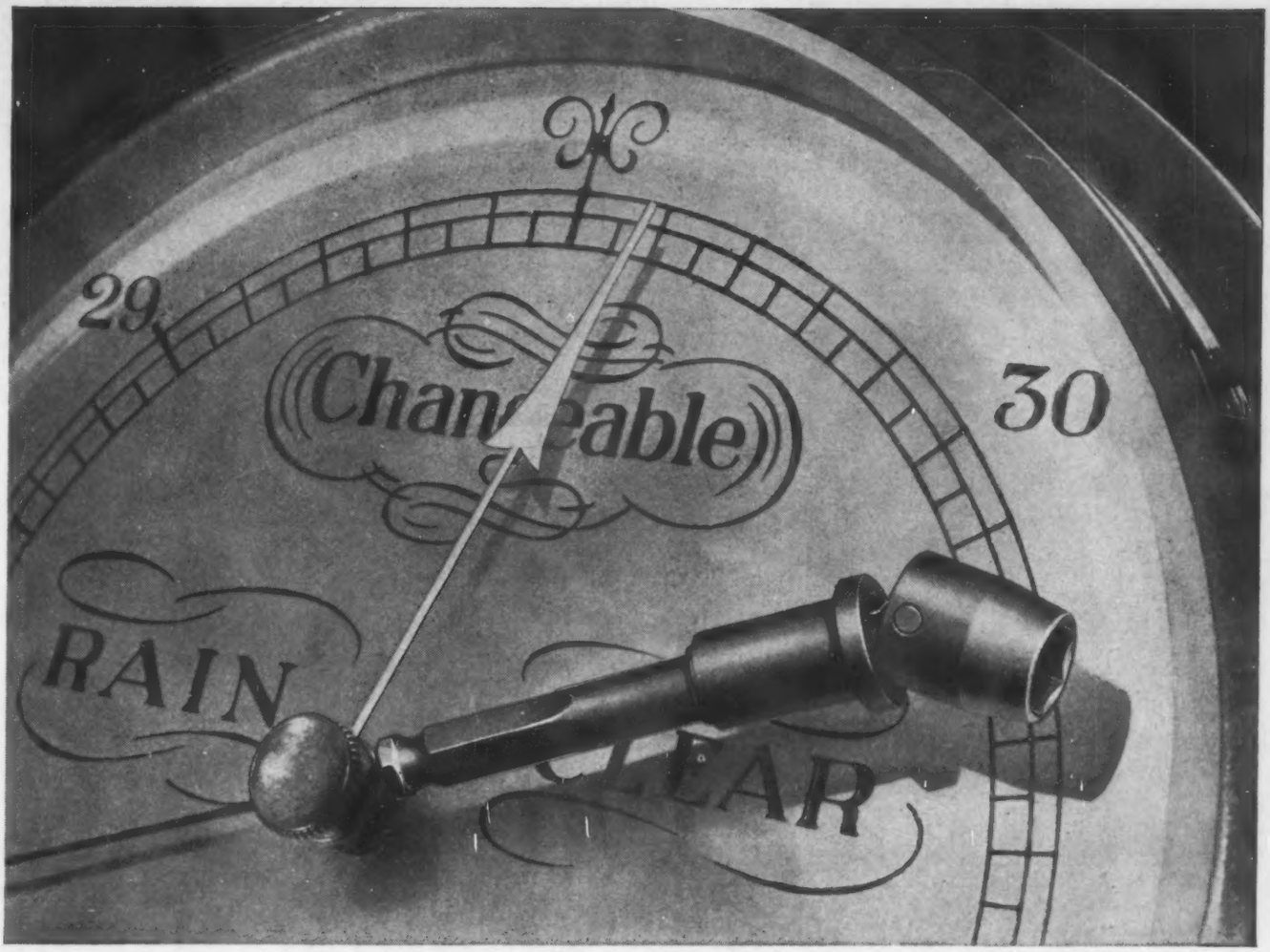

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NEW APPLICATIONS of the HARTFORD SUPER-SPACER are being made every day

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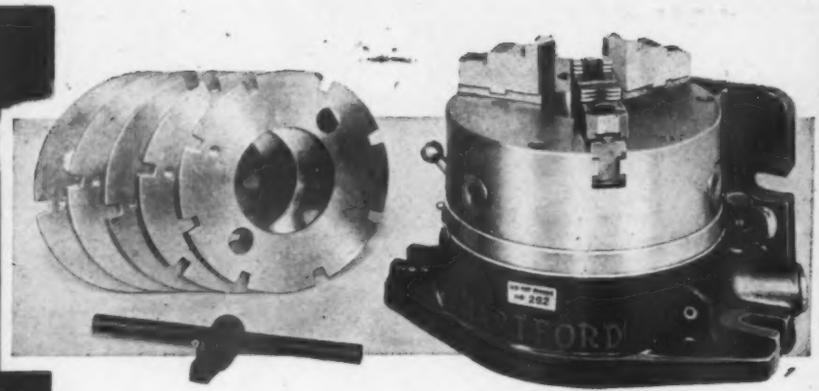

Hardly a day passes but new applications of the Super-Spacer are being made. Inasmuch as each application results in an improved method of handling a job, the advisability of your investigating the Hartford Super-Spacer and its possibilities in your shop is apparent. Why delay.

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This low cost machine will handle internal keyseating jobs up to 1¼ in.

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- LOW CHASER COST
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Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

See our Advt on page 31(May 8th. American Machinist

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Set of 19 does work of 209 solid arbors, thus saving the time lost in making or looking for them. For all bores 1" to 7". Hardened tool steel. Sold singly or in sets. Bulletin 1043.

Other Products: Steam Traps, Control Valves, Arbor Presses, etc.

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STRATEGICALLY-LOCATED
. . . AT COLUMBUS, OHIO
COMPLETELY-EQUIPPED
. . . SOME 400 MACHINE TOOLS, PLUS
OTHER PRODUCTION EQUIPMENT
TAPERED ROLLER BEARING PLANT
. . . READY TO OPERATE
FOR SALE OR LEASE

War Assets Administration offers for sale or lease, as a unit, this completely-equipped plant, ready now for immediate production of tapered roller bearings or a similar type of accessory or machinery item.

LOCATION: Plant site, 1025 Cleveland Avenue, Columbus, Ohio. Ready access to both raw material sources and industrial markets.

BUILDINGS: There are 3 buildings as follows: Building "A" (Office, Canteen and Shop) one-story timber frame on concrete footings, cement block walls, built-up roofing, approximately 100,000 sq. ft. of floor area.

Building "B" (Manufacturing Building) one-story steel frame on concrete foundations, composition roofing on concrete slab, reinforced concrete and slag floors, approximately 104,400 sq. ft. of floor area.

Building "C" (Boilerhouse) a ball-bearing building with composition roof on precast slabs on steel beams and purlins, walls are brick and floor is monolithic concrete, approximately 3,500 sq. ft. of floor area.

LAND: Approximately 9 acres, fronting 227 feet on Cleveland Avenue.

MACHINERY AND EQUIPMENT: Various types of production equipment including: demagnetizers, furnaces, heat exchangers, pumps, quenching machines, scales, washers. A complete assortment of machine tools including: lathes and machines used for boring, briquetting, grinding, drilling, honing, lapping, milling. Miscellaneous metal forming and sheet metal tools, laboratory and testing equipment, furniture and fixtures. There are 10 cranes; one 5-ton, five 2-ton, two 1-ton and two portable cranes.

TRANSPORTATION: Plant is serviced by the Pennsylvania R.R. with main line adjacent to property. This property is located in the industrial area of the city with access to several main and secondary highways.

Sealed proposals, in duplicate, on Uniform Bid Forms, for purchase or lease of this property known as the Timken Roller Bearing Plant, Plancor 920, will be received by the Cincinnati Regional Office, War Assets Administration, until June 13, at 2:00 P.M., E.S.T., at which time proposals will be publicly opened and read.

Data herein are not intended as a basis for negotiation. Use of the lessee's name is for identification only and has no connection with the lessee's own facilities. War Assets Administration reserves the right to reject any or all proposals.

Credit terms for the purchase of this property may be arranged. If you qualify as a small business firm, you are entitled to special consideration for purchase through the Reconstruction Finance Corporation.

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1131-T

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OFFICE OF REAL PROPERTY DISPOSAL

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"we proved our ability to be of service . . ."

says W. H. Hualster

STUART OIL COMPANY REPRESENTATIVE

Stuart Oil Performance Report on ThredKut 61

Type of product manufactured by company covered in this report:
Machined parts from rough forgings

Personnel interviewed:
Machine Shop Supt. and General Foreman

Stuart Oil Products used in this plant:
ThredKut 61. Solvol

Specific operations covered by this report:
Drilling and boring forged "5060" Steel pump liners

Performance details:
"Problem was presented here in boring 7¾" dia. holes through 11" dia. x 30¾" solid forged pump liners running about 170 Br. Liners are run on two heavy duty lathes, one starting with a 1" dia. drill followed with a boring bar; the other a heavy boring bar used for removing entire 7¾" of stock.

"Solvol was performing well on 4615 steel, but when 5060 steel was substituted, they could barely get 1 to 1½ liners per day. From one lathe. Switching to ThredKut, tool life improved, but still only got one liner per tool grind, plus terrific vibration. Our inspection was in order. A 6-1 blend of ThredKut and Ptfe. was decided upon...and it licked the trouble...they now turn out 3½ liners per day per lathe, meeting production schedules...and are very appreciative of our help in solving this problem."

W. H. Hualster

HERE is another case where Stuart engineering service played an important part in solving a tough cutting problem. No "panacea" for all metal-working ills, Stuart Oil products must be used correctly to meet specific requirements. In this instance, the *right* oil was being used, but without necessary dilution. Our background and experience in helping to solve scores of similar problems is available to assist *you* in analyzing cutting fluid requirements. Write for further information.

Illustrated is one section of the completely equipped Stuart Metallurgical Laboratory, where the "Straight Line to Metal-Working Efficiency" begins.

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STUART *service goes with every barrel*

Fray "ALL-ANGLE" MILLING ATTACHMENT

EASY TO HANDLE
FLEXIBLE
UNIVERSAL • STURDY

It is an all purpose attachment which has thoroughly proved itself all over the world. Ideal for the making of plastic molds, die casting molds, permanent mold casting molds, metal patterns, tool and die making, production work of all kinds, as well as for grinding, drilling, boring, etc.

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ADJUSTABLE
Pats. Pending

DRILL UP TO 6 or 8 HOLES AT ONE STROKE IN *ANY* PATTERN WITH MULTI-DRILL

Fits ANY Drill Press

The 8-spindle unit in the MULTI-DRILL line brings your single spindle tools even greater production capacity and wider operating range. You can drill up to 8 holes at one stroke in *any* hole pattern on or within a 9" circle . . . ½" center distances . . . drill sizes 1-32" to 3-8". (Special adaptations available.) All the features which make MULTI-DRILLS preferred tools are built in . . . fast, easy positioning of locating arms . . . heavy duty, long-life block-type universal joints . . . "Oilite" lifetime bearings . . . precision collet spindle assemblies and rugged construction throughout assure long trouble-free service. The 6-Spindle MULTI-DRILL handles any hole pattern on or within 5" circles—½" min. centers.

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In San Antonio manufacturers save on heating, initial building, living costs. Year-'round outdoor working conditions—without interruptions due to climatic extremes—allow steady production. Products are sold immediately in *growing* markets. San Antonio is the center of commercial activity in a rapidly developing territory. Tremendous new manufacturing, oil, natural gas, construction, transportation, agricultural enterprises bring a steady stream of new people, payrolls, business!

Government agencies such as the Army Air Corps have appealed to local plants to supply millions of dollars' worth of metal articles annually! Skilled workers are adapted through experience to meet all requirements. Major labor troubles are unknown. Low tax and utility rates, great abundance and variety of raw materials assure success in metals manufacturing.

Get the full story of San Antonio! Learn of the warm welcome offered you by its citizens. Send today for the new book "San Antonio Sets the Stage For Industry." Have your secretary attach the coupon to your business letter-head!

SAN ANTONIO OFFERS:

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TAXES AND INDUSTRIAL LAWS: Texas has no state sales or income taxes. Industrial laws and regulations are drawn to encourage the development and expansion of industry.

TRANSPORTATION: San Antonio is served by major rail, air and truck lines radiating in every direction. Texas has excellent trunk and feeder highways. Only three hours by truck or rail to low-cost water transportation.

RAW MATERIALS: San Antonio metal industries have easy access to sources of all kinds of metals —short, direct connections to Southwestern processors of new lightweight metals.

POWER AND FUEL: Low-cost natural gas is abundant. Electric power is adequate and reasonable.

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HASKINS

HS-4; widely used in fabrication of all steels; ½ h.p. multi-speed, countershaft unit, 1500 to 7800 R.P.M., mounted bench height on caster base, 360° swivel. One of many models.

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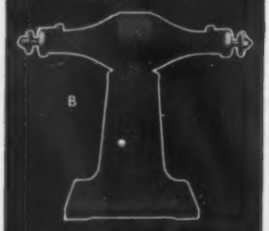

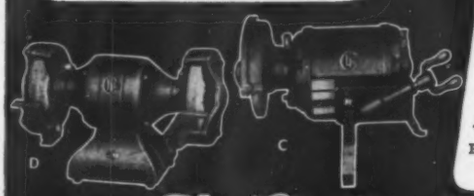

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Original System of Inserted Blade

OK Milling and Boring Tools

See Issue March 27, 1947 American Machinist

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Die-Making Machines

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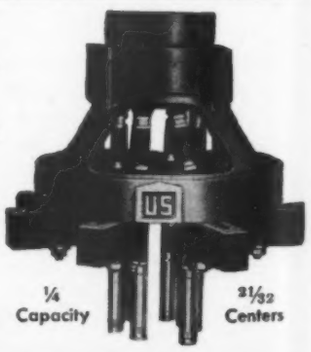
multiple spindle
DRILL HEAD 8 spindles
Adaptable to 14" x 17" Machines
6" Drilling Area



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21/32 Centers

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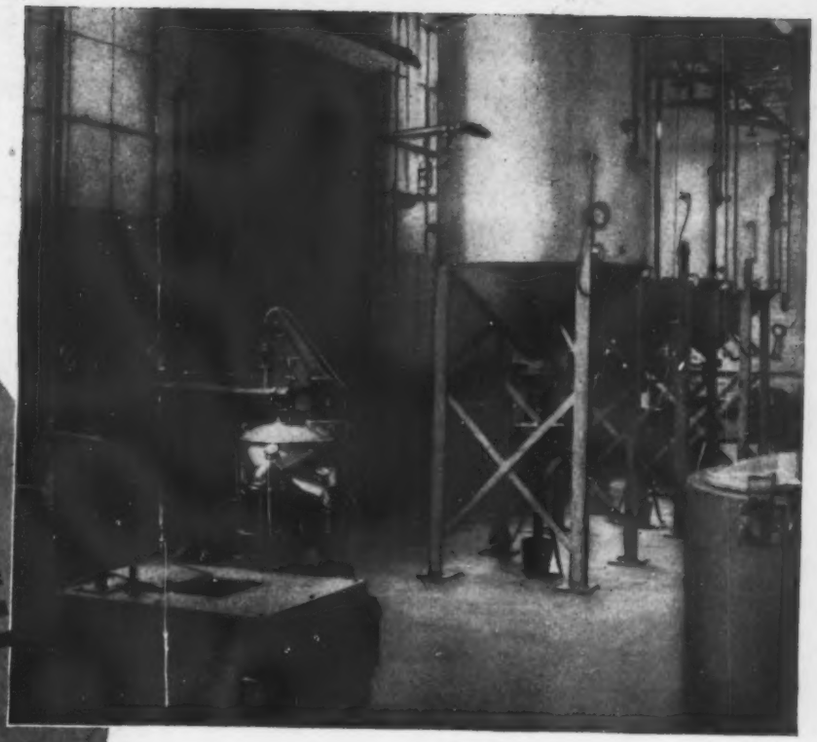

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Ball & Bronze bearing throughout.

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Also: Multiple drilling & tapping attachments, auto opening dieheads, clutch tappers to 2" taps.

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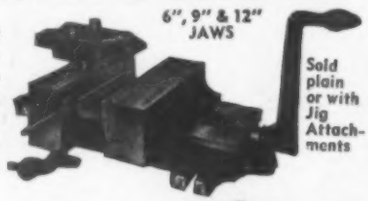

BULLETIN 41 describes and prices above Vise, also our KNURL HOLDER FITTING LATHE TURRET

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for more successful employee relations in shop or plant . . .

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Eliminate hand sanding and filing the modern way

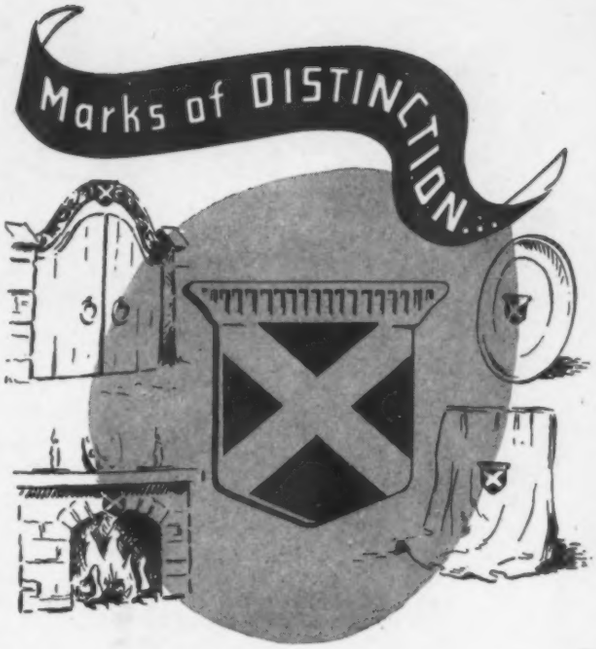
Recommended for grinding and sanding flat surfaces of wood, metal, hard rubber, celluloid and molded compositions. Finer quality work and increased production are assured where these machines replace slow, laborious hand methods. Furthermore a straight grained finish result in savings in both time and material.

SPECIFICATIONS

Abrasive Belt—14" wide x 11'1" long
Height 39"
Width 49"
Length 60½"
Floor to top of belt table 36¼"
Belt Table—15⅜"x35"
Work size—30" long

Write for illustrated literature.

Production MACHINE COMPANY GREENFIELD, MASSACHUSETTS, U.S.A.



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To set your product apart from others that are similar you need some distinctive marking—trademarks, product names, part numbers—every type of marking for your product to insure your own protection and to eliminate confusion.

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For all types of identification and inspection marking Matthews offers trademark and special dies, single symbols, and holders for interchangeable segment type. These are made separately for flat, concave or convex surfaces and feature the Matthews "Pittsburgh Bevel" and "Safe-Hed" for accuracy and safety. Write for Supplement A.

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BRANCH PLANTS
NEW YORK, BOSTON, CHICAGO, PHILADELPHIA, NEWARK, SYRACUSE
District Sales Offices: Cleveland Cincinnati, Birmingham, Dallas

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The Pioneer

Almond Three-Jaw Drill Chucks were Pioneers in their field—the first to be placed on the market. They have formed a necessary part in the logical procedure of machine developments over the past seventy and more years.

Almond Drill Chucks are made in types and sizes *to fit all machine tools and portable drills.*

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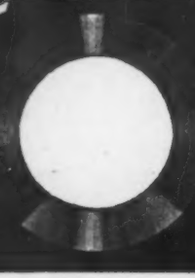
ASHBURNHAM, MASS., U. S. A.

The Original Manufacturers of Drill Chucks

A PERFECT HOLE IS A LOVELY THING!



Especially to the precision manufacturer whose spoilage is excessive.

But clock, watch and instrument makers have learned that a perfect hole is routine when Hamilton Super Sensitive Drilling Machines are used. For these small-hole drills (.004" to 5/16" in all drillable materials) are, themselves, precision instruments. What's more, they maintain their accuracy under tough production loads.

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. . . and let a Linley Milling and Jig Boring Machine handle small, fussy work on dies, jigs, patterns, fixtures, etc., that crowds busy toolrooms. Release larger machines for work better suited to their capacities . . . cut toolroom time and cost.

Eight spindle speeds—275 to 4250 rpm—provides a speed for every need, means less tool breakage. Direct micrometer setting eliminates errors, speeds set-up, assures accurate machining. Quick changeover from one type of production to another. Fits in 2½ ft. sq. area, has ample 7" x 17½" table. Operates on ½ hp motor.

For the small job—
let a Linley do it!

Write for detailed Bulletin

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Complete range of styles and sizes

In addition to the style "BW" Oil Gauge illustrated, the Gits Line of Gauges provides a complete range, including flush mount and angle types. All styles are illustrated and completely described in the Catalog No. 60—which also presents many and varied types of oilers, seals and lubricating devices. If you have a gauge or lubricating problem, send your specifications for recommendations and prices.

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Exclusive for over 35 years

You can help your shop stabilize profits—
You can increase your own worth—by learning

How to estimate the time any machining job will take

HERE'S the kind of on-the-job help you need to make quick, reliable estimates of the time it takes to do the different machining operations in any machine-shop—large or small. Whether a job involves drilling, boring, tapping, threading, grinding—or any of the scores of other operations—this handy manual tells you exactly what to consider in estimating job-time. It covers every step—from setting up the job, to tearing it down—giving reasonable time values for each, based on actual experience. The various non-machining operations which enter into the cost of any job are also given. Instructions are provided for the use of several methods of estimating specific jobs on each type of machine in use today.

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By W. A. NORDHOFF
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THIS book sets down the principles of machine-shop estimating so clearly and concisely that you can put them to use immediately. It teaches you step-by-step how to estimate the time it takes to manufacture specific machined parts, classifying every job into machining and handling operations. It supplies a self-explanatory breakdown of all the elements for each operation and gives the time value established for each. These time values are presented in decimal minutes and are carried out to three places. In addition the book includes: sample estimates for each operation described, tables of variables and constants, and 93 typical problems to assist you in making your own estimates accurately and speedily. 486 illuminating charts, diagrams, tables and photographs are included to illustrate the topics discussed.

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—counterboring
—spot drilling
—facing
—slab milling
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ONLY the PATENTED construction of LUERS cutting off BLADES permits normal expansion of bursting chips — MEANS MAXIMUM CUTTING EFFICIENCY.

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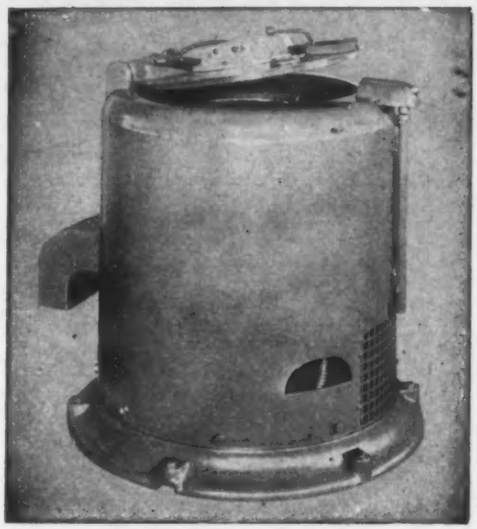

The Barrett Centrifugal Dryer — efficient, self-contained, and compact is built in several sizes.

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In operation, parts to be dried are placed in a well ventilated motor driven rotating basket. Free liquid is immediately thrown off by centrifugal force and any moisture remaining on parts is absorbed in the shortest possible time by the large volume of expanded air continually forced over and through the contents. Provision is made for heating and expanding, also boosting the flow of incoming air to assure faster absorption of moisture. With the large exhauster provided, heated air is not always required.

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SAVES TIME MAKES MONEY

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CUTS ANY SHAPE CUTS ANY SIZE

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CAPACITY UP TO 1/4" STOCK

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Here's the shear that offers best performance features. Cutting speed 6' per minute. High grade tool steel cutters. Write today for details. Prompt shipment.

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Pipe Burners

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. . . Just Connect to Gas Supply

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Designed to solve numerous Industrial Gas applications, "BUZZER" Burners are unexcelled for Efficiency, Economy, Simplicity and Flexibility. Large variety of models available.

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MACHINE WORK WANTED

Large mechanical engineering organization has open capacity for designing and building special machinery, tools, jigs, fixtures and general production machine work. All facilities are modern and our men are accustomed to precision machining.

23—Milling Machines, #1 to #4
16—Engine Lathes, 10" to 50"
6—Radial Drills, 3' to 6'
8—Vertical Boring Mills, 36" to 54"
2—Horizontal Boring Mills, 3" & 4" bar
Grinding and Heat Treating Equipment

An opportunity to quote on your requirements will be appreciated.

Plant location:—PHILADELPHIA, PENNA.

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WANTED PRODUCTS OF CONTRACT WORK

Machinery manufacturing concern with extensive experience desires a product to manufacture on a contract basis or straight contract work.
Manufacturer has modern well equipped machine shop, capable of making small, medium or large machinery, tools, jigs, fixtures, gages, stamping dies, stampings, electronic assemblies, gear drives and small parts of all types. Excellent engineering facilities and good contacts for all types of foundry work are available.

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NORTH ATTLEBORO MASSACHUSETTS

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Capacity available for quantity production of small and medium quality castings from match plates.

CATSKILL METAL WORKS, INC.
CATSKILL, N. Y.

Wood Patterns and Metal Patterns
For
All Types of Castings
Complete Machine Shop Facilities
Let us know how we can serve you
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214-220 Adams St.,
Hoboken, N. J.

SCREW MACHINE and TURRET LATHE PRODUCTS
Gears, Sprockets, Standard and Special. Milling, Drilling and Surface Grinding. Short or Long Runs. Quick Delivery.
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AMERICAN MACHINIST
330 W. 42nd St., N. Y. 18, N. Y.

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SPECIAL SPUR GEARS
Flanged Pinions, Internals
Up to 18" Pitch Dia.
Small Quantities Made Economically
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Stampings—Gears
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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us - we will take care of them
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WANTED — CONTRACT WORK
Metal Fabrication Manufacturer with extensive production experience has additional capacity in small welding plant. Can perform sawing, flame shape cutting, drilling and welding operations. Send your inquiries or drawings to
THE B-H CO., INC., CAMBRIDGE CITY, IND.

SEARCHLIGHT SECTION

Employment • BUSINESS • OPPORTUNITIES • Equipment—Used or Resale

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NIGHT SUPERINTENDENT — Matured man with background originating as journeyman machinist. Must have had successful supervisory history. Complete knowledge of production control, time study, cost and how to meet production schedules essential. Modern precision machine manufacturing plant located in the Fox River Valley. Salary open. P-941, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS $2,500-$25,000. This thoroughly organized confidential service of thirty-seven years' recognized standing and reputation carries on preliminary negotiations for supervisory, technical and executive positions of the calibre indicated through a procedure individualized to each client's requirements. Retaining fee protected by refund provision. Identity covered and present position protected. Send only name and address for details. R. W. Bixby, Inc., 266 Dunn Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

CHIEF INSPECTOR (also willing as 1st class inspector). Engineering background, able to set up modern inspection department supervising any machine operation. Accustomed to closest tolerances. Lay-outs, tools, fixtures, 20 years experience. Owns late precision tools. Best references. W. Basch, 224 West 72nd St., N. Y. 23, N. Y. Phone TR 4-4281.

Additional Employment Advertisements on Opposite Page

WANTED

SALES EXECUTIVE

Thoroughly conversant with high production drilling machines and their application, construction, and engineering.

Capable of directing Estimating Force, Field Salesmen, Service Men, and office routine.

Prefer man not over 40 years of age. In applying give complete experience and other information, all of which will be held confidential.

P-939, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

Don't forget
the BOX NUMBER

. . . when answering the classified advertisements in this magazine don't forget to put the box number on your envelope. It's our only means of identifying the advertisement you are answering.

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EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE

(Not available for equipment advertising)

60¢ per line, minimum 4 lines. To figure advance payment count 6 average words as a line.
POSITIONS WANTED (full or part-time individual salaried employment only), ½ above rates.
PROPOSALS, 50 cents a line an insertion.

INFORMATION

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED RATE:

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISING received by 10 A. M. May 19th will appear in the issue of June 5th subject to limitation of space available

PLANT MANAGER, GENERAL SUPERINTENDENT

25 years experience in General Plant Administration. Metal field on job shop work and line production, technical graduate. Thorough knowledge of modern manufacturing methods. Engineering, foundry, tools and machine shops. Age 50, salary reasonable. Free to locate anywhere in U. S.

PW-930, AMERICAN MACHINIST
330 West 42nd St., New York 18, N. Y.

Exclusive Representatives Wanted

For line of hydraulic, air hydraulic and straight airpresses and vises. Sales engineering experience desirable. Some good territories still open.

RW-929, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

SALES ENGINEERING OPPORTUNITY

For young engineers with electrical or mechanical degrees, sales aptitude, intelligence, good judgment and initiative.

Men selected will be given training by nationally known manufacturer of motor control and power distribution equipment preparatory to branch office assignment as a field engineer. Selling or electrical experience is desirable, although not essential.

Work is permanent and opportunities are excellent. Give qualifications in detail.

SW-938, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

POSITIONS WANTED

(Continued from opposite page

CHIEF COST Estimator, technical education, 14 years experience in time study, production planning, cost and methods analysis and estimating in precision and commercial, job shop and high production machinery, flat metal fabrication, assembly and tooling with thorough knowledge of all types of machinery and establishing manufacturing standards. Will also accept foreign assignment. PW-942, American Machinist, 330 W. 42nd St., New York 18, N. Y.

SELLING OPPORTUNITIES WANTED

EXCLUSIVE DISTRIBUTORSHIP wanted. New St. Louis Company desires to handle quality line of electrical and metal products. Will act as distributor or representative of machine tool company. RA-943, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

SALES ENGINEER with 25 years experience contacting mill supply and hardware jobbers throughout the middle west. Presently located in Ohio. Interested in lining up with good reputable full time line or representation for mill supply and hardware trade. Severing present connection, available soon. Excellent references. RA-944, American Machinist, 330 W. 42nd St., New York 18, N. Y.

BUSINESS OPPORTUNITY

LONG ESTABLISHED progressive organization, with national distribution to the wholesale plumbing and heating supply trade and having a successful background of sales, seeks an additional product of merit which is not producing sales volume and profit it should. Equitable working arrangements can be made to financially subsidize or to carry own accounts if necessary. Correspond with Harry Jaye & Co., 154 Nassau St., New York 7, N. Y.

PATENT ATTORNEY

PATENT and Trade-Mark Practice before U. S. Patent Office Validity and Infringement Investigations and Opinions Booklet and form "Evidence of Conception" forwarded upon request. Lancaster Allwine & Rommel, Registered Patent Attorneys, Suite 453, 815-15th Street, N. W. Washington 5, D. C.

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If You Want to Buy, Sell, or Trade
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Consult Us Immediately
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OFFICE AND WAREHOUSE
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CLEVELAND 13, OHIO

Each "Searchlight" advertisement

represents a current WANT of an individual or concern, in the metal working industry served by this publication with some element of profit in each, for both buyer and seller.

Some are employment opportunities; other offer solutions to pressing production problems; still others offer good used equipment.

"Searchlight" advertisements are constantly changing. New opportunities find their way into this great WANT medium, each issue. Regular reading of the "Searchlight" pages can be as important to you as reading the editorial pages. One is news of the industry, the other — NEWS OF OPPORTUNITIES currently offered in the industry.

for

EVERY BUSINESS WANT

Think* "SEARCHLIGHT" *First

SALES REPRESENTATIVE NEW ENGLAND

Covering metal manufacturing plants—long established in territory—specialize on parts or raw material for production such as gears, bearings, stampings, castings, screw machine products, etc. Can handle one more line.

RA-928, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

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Machine service engineering 15 yrs. experience servicing, repairing and reconverting engine lathes, turret lathes, milling machines, shapers, surface grinders and boring mills.
Write or wire your problems for dependable service

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ATTENTION MANUFACTURERS

Sales organization, calling on hardware and mill supply distributors in New England, New York, New Jersey, Pennsylvania, Md. Del. and Washington D. C., is seeking another good line. Hard-hitting intelligent sales staff. We are particularly interested in builders hardware but will be glad to consider other lines of merit.

RA-940, AMERICAN MACHINIST
330 W. 42 Street, New York 18, New York

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CHAIN STORE SALES?

Highly rated sales organization with 25 years established connections in Chain & Department Store Fields seeks items capable of development into volume sales.

KARAVAN TRADING CO.
263 5th Ave., New York 16, N. Y.

WORLDWIDE DESIGN SERVICE
Consultants

Products—Special Machines. Processing & Tooling—Low & High Prod. Patent Drawings—Service Manuals. General Drafting. For Individuals & Small Manufacturers. A Complete Engineering Service by Mail.

P. O. BOX 224 ROCHESTER, N. Y.

AUCTION ADVERTISING Page 264 — WANTED ADVERTISING Page 274

1,844,000 SQUARE FEET of MODERN FACTORY BUILDINGS

to be sold at **PUBLIC AUCTION**

by order of

WRIGHT AERONAUTICAL CORP.

TUESDAY, **JUNE 17, 1947** AT 2 P.M.

PLANTS 1 AND 2 AT PATERSON, N. J.

- AS A WHOLE
- IN PARCELS

This auction presents an unusual opportunity for industries to acquire space that is adaptable to any type of manufacturing use and AT BARGAIN PRICES for IMMEDIATE OCCUPANCY. Location is desirable, labor supply abundant, transportation facilities excellent, utilities fully available, State and Community cooperation to the fullest.

INSPECT NOW!

For prospects' convenience, Auctioneer's offices have been established on the premises, Plant 1, Beckwith Ave., Paterson, N. J. No appointment necessary between 10 A. M. and 4 P. M., Mondays through Fridays. Appointments for Saturdays, Sundays and Holidays will gladly be arranged.

WRITE FOR FREE 32-PAGE BROCHURE!

Contains complete details of these properties including floor plans, construction charts, exterior and interior views, etc.

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AR ASSET REALIZATION CO.

HERBERT I. SEGAL, *President*

26 EMERSON PLACE • NEWARK 5, NEW JERSEY

EVERY ITEM GUARANTEED AS REPRESENTED

FALK FOR DEPENDABILITY IN REBUILT MACHINERY

AUTOMATICS

2—#00 Brown & Sharpe Full Automatic, Standard Speed

1—1¼" Cone 4-spindle Automatic, Motor Driven, Threading Spindle

1—#515 National Acme 9/16" 4-spindle Automatics, complete

LATHES

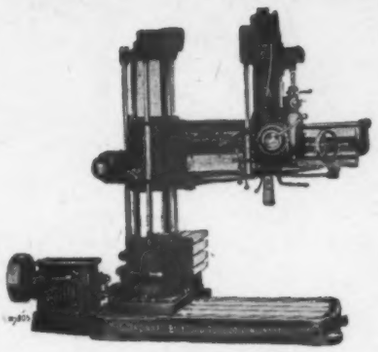
10"x24" Logan Q.C.G. Lathes (new)
Sebastian Engine Lathes (new)
14"x6' Hendey Yoke Head
14"x6' Rockford Cone drive (two)
16"x6' American Motor Driven Lathe
16"x8' Lodge & Shipley 12-speed Grd. Hd.
16"x8' Monarch Geared Head Lathe
18"x10' American, Geared Head, Taper
18"x6' American Q.C.G. motor drive
20"x10' American Q.V.G. motor drive
20"x11' Schumacher-Boye, M.D.
24"x12' LeBlond Heavy Pattern
26"x18' Bridgeford geared head
28"x10' Davis cone driven
32"x16' Bridgeford geared head

TURRET LATHES

4—#4 Warner & Swasey Hand Screw Machines, arr. Motor Drive
2—#4 Warner & Swasey Universal Turret Lathe, Motor Driven
16" Warner & Swasey Brass Lathe
#2A Warner & Swasey Universal
#3A Warner & Swasey Universal, motor drive
#3R Gisholt Universal like new
#4 Foster GFH Hand Turret Lathe
3—Morey #2G Geared Head Turret Lathe, motor drive (late model)
2—Simmons #2 (microspeed) Turret Screw Machine (late model)
Bullard 42" Vertical Turret Lathe
#3A Warner-Swasey Universal with motor drive

PLANERS

Betts 120"x72"x35' Metal working Double Housing Planer. Equipped with: 4 heads and power rapid traverse. With motor drive and controls, bed is 61' 3½" long
20"x20"x24" N.B.P., Planer Shaper
26"x26"x8' Gray Planer, 2 heads



RADIAL DRILLS

3½' Arm, 10" Column Cincinnati-Bickford
4' Arm, 11" Column Cincinnati-Bickford
5' Arm, 13" Column Cincinnati-Bickford
5' Arm, 14" Column Fosdick, motor drive
6' Arm, 15" Column Cincinnati-Bickford

Cincinnati-Bickford 5' Arm, 13" round column with air clamp. Oil grooved, tee slotted base, side base, with plain box table with #5 Morse Taper spindle. Motor drive.

FOUNDRY MOULDING MACHINES

2—#0 Johnston & Jennings, Jolt Squeezer Draw Pattern, 15"x21" Table
2—#342 Osborn Jolt Rollover Pattern Draw Moulding Machines, 23x38" Table
2—SPO Hand Rollover Power Draw Moulding Machines complete with run-out cars 22½"x60"
1—#602 Osborn Jolt Rollover and Pattern Draw, jolt cap. 900#, 36" flask length.

SHEARS & METAL WORKING

Lennox Splitting Shear, ¾" cap.; 8' throat
Lennox Bevel Shear, ¼" cap.
Peckstow 30"x18 ga. Squaring Shear
Niagara 48" Roller Leveller, 8 Rolls
West Co. 36" x 10 ga. 15" gap, Power Squaring Shear

MILLING MACHINES

#3, #4, #5 Cinn. High Power, Plain, S.P.D
#1 Brown & Sharpe Plain Miller
P & W 2½" Duplex Spline Miller
Thread Miller, Hall Planetary #1—24"
#8 Lees Bradner Thread Miller
#1, #2 Kempsmith Plain Millers
#3B Hendey Universal Miller, motor drive
#4 Cinn. Vertical High Power Miller. (2)

GRINDERS

Queen City Dble. End Grinders, new
#33 Abrasive Vertical Surface motor drive
12" No. 22 Heald Rotary Surface Grinder
16" Persons-Arter Rotary Surface Grinder
1—Seybold 96" Knife Grinder
Oliver of Adrian Drill Grindefs
Cincinnati Centerless Grinders #2 M.D.
#12 Greenfield Internal Hydromatic Grinder, sizematic type
#2 Brown & Sharpe Surface Grinder
#70 Heald Internal Grinder
#60 Heald Cylinder Grinder
10"x18" Norton Cylindrical
2—Cincinnati, #1½ Tool & Cutter Grinders

BORING MILLS

3½" Bar Landis-Rochester Horizontal Boring Mill, Model #36

#31 Lucas Horizontal Boring Mill, 3" bar

DRILLING MACHINES

Avey, 2 & 3 spindle Prentice, 4 spindle
Henry & Wright, 6 spindle, #2 M. T.
Fosdick 13" Super speed 4-spindle drills
Natco #12, 12 spindle #1 M. T.
2—Natco #14, 22 spindle Rectangular head Drilling Machine, #2 M. T.

POWER PRESS HEADQUARTERS

#4¾ Bliss Dbl. Crank, Solid Frame Power Press, 4" stroke, 5" shaft
2—#1A Standard Bench Type Press, ¾" stroke
#4 Bliss D. C. Forging Press
200 ton A.C.F. Hydraulic Press. Bed. 24"x36", 4-post.
Hilles & Jones #4 Single End Punch and Shear. Equipped as Plate Shear with 18" Blades. ARR, motor drive, 48" throat
#76½B Bliss Single Crank, Geared Power Press, 3" stroke, 7" shaft

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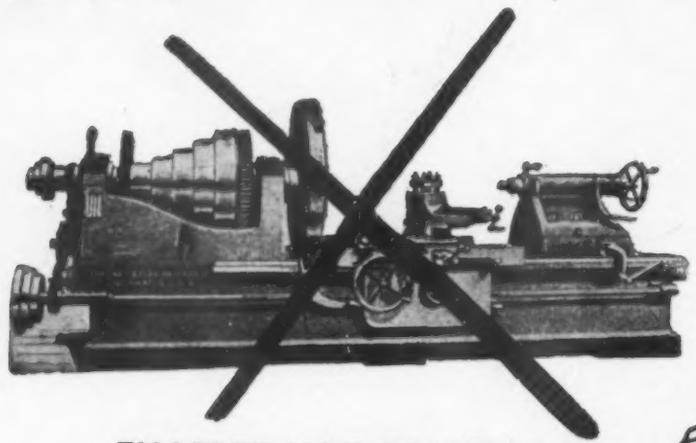

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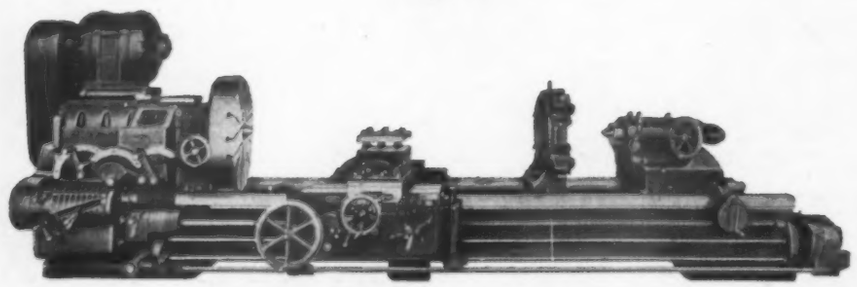

MODERN—LATE TYPE MACHINE

NEARLY

AUTO. SCREW MACHINES

ACME GRIDLEY Model RA-6, 2", Latest Type
BILLINGS & SPENCER B-2 Diametic—Latest
BROWN & SHARPE #4 Highspeed, 1½" cap., Latest Type
CLEVELAND ⅞" to 2¼" Model A
CONOMATICS 3½" 4 spindle—latest type
CONOMATICS 2⅝"—6 spindle, Latest Type
NATIONAL ACME 9/16" mod. C, 5 spdle., M.D.

BORING MILLS—Horizontal

DETRICK & HARVEY—4" bar—floor type—motor drive
DETRICK & HARVEY—3" bar—floor type—motor drive
FRANKLIN 4½" bar, single pulley drive
GIDDINGS & LEWIS #0, 3½" Bar, Motor Drive
LANDIS #35—3½" bar—floor type
NILES BEMENT POND 5", 6", 7" bar—floor type
NILES BEMENT POND 72" Duplex, 4½" bar, M.D.
OHIO #5F-420 5" bar, floor type, latest type
P & H #10, 3½" bar, floor type, M.D.
UNIVERSAL #40—4" Bar, Motor Drive
UNIVERSAL #3A—3" bar, Motor Drive

BORING MILLS—Vertical

BETTS 120"—2 swivel head, motor drive
BETTS (Consolidated) 100"—2 heads, DC, Latest Type
BETTS (CONSOLIDATED) 84" 3-heads, AC Latest Type
BULLARD 36", New Era Type, M.D.
BULLARD 42" Spiral Drive, latest type
CINCINNATI Hypro 84" 3-heads, AC Latest Type
COLBURN 72" 2 swivel heads, AC, M.D.
KING 36" Turret, MD, Latest Type
NILES 42"—2 swivel heads; power rapid traverse
NILES 73", 2 swivel heads, PRT, AC, M.D.
NILES 100", 2 swivel heads, PRT, M.D.

DRILLS

BAKER #121 Single spindle—latest type
BARNES #H3, Hydram, latest type
BARNES #210—single spindle—latest
BODINE 42-20, 42-30 automatics—M.D.
COLBURN #14, 2 spindle, heavy duty, AC, M.D.
EDLUND #1B, #2B, #2MS, M.D.
FOOTE BURT SIPP #2, #3—single spindle—latest
HENRY & WRIGHT 2 spindle
PRATT & WHITNEY No. ½Bx50" 2 spindle, Deep Hole latest type

MOREY MODERN MACHINERY

DRILLS—Radial

AMERICAN 3½'9"—Maxi-Speed, Motor Drive
AMERICAN 4'11"—5'13" AC, M.D.
AMERICAN 5', Univ., AC, M.D.
AMERICAN 7' Triple-purpose, M.D.
CANDEY OTTO 3'11" New
CARLTON 4'13", 6'15"—M.D.
CINCINNATI BICKFORD 5'13" M.D.
CINCINNATI BICKFORD 6', Univ., AC, M.D.
DRESES 5'13", 4'13" AC, M.D.
DRESES 5'15", Universal, AC, M.D.
FOSDICK 5'14", AC, M.D.
MUELLER 4½'9", 4'11" AC, M.D.
NILES BEMENT POND 6'15" uni., AC, M.D.
RYERSON 4'11", AC, M.D.
WESTERN 3', 4'18", 5'18", 6'20", latest type

GEAR CUTTING EQUIPMENT

BARBER COLMAN Type A Hobber—latest
BARBER COLMAN Type S, #3 #12 Hobber, M.D.
BROWN & SHARPE #3H gear cutter, M.D.
CROSS #73 Univ., tooth-rounder, Latest Type
FELLOWS #7, #7A type, all models, latest
FELLOWS #6, #6A type, all models, latest
GLEASON 11", 18" bevel gear generater, M.D.
GLEASON #13 tester, M.D.
GLEASON 15" Quenching Press
GLEASON 24" Bevel Gear Planer
GOULD & EBERHARDT 12 H.S., Latest Type
HERCULES 24" HOBBER, differential, M.D.
NEWARK #5, 72" Hobber, Latest Type
PRATT & WHITNEY 10" Grinder, hyd.—latest type
SCHUHARDT & SCHUTTE #1, #2, Hobber, differential, infeed, M.D.

GRINDERS—Cyl.—Plain & Uni.

BROWN & SHARPE #1, #2, #3, #4 Univ., motor drive—latest type
BROWN & SHARPE #5 Plain 3x12, LATEST

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BROWN & SHARPE #20—plain—10x18—Latest Type
LANDIS 6x18, 6x20, plain, M.D.
LANDIS 6"x18" Type C Hyd. Latest Type
NORTON 10x18 Plain—motor drive
NORTON 10x36" Plain Type C, Hyd., latest type
NORTON 16x72 Plain, Type C—latest type
NORTON 16x72 Universal, HYD., Multi-purpose, Latest Type

GRINDERS—Internal Cutters & Miscellaneous

BROWN & SHARPE #10 Tool & Cutter—latest
BROWN & SHARPE #13, Universal Tool, Latest Type
BRYANT No. 16—16" Chucking—Internal—latest
BRYANT #5 Internal, hyd., latest type
CINCINNATI #2 Univ., Tool & Cutter, Latest Type
CINCINNATI #4 centerless, LATEST TYPE
FITCHBURG Uni., spline shaft, hyd.
GLEASON #12 cutter grinder
HEALD 72A3 Sizematic Internal, latest type
HEALD 72A5 plain internal, latest type
HEALD #81, Bizematic, Gagematic, Latest Type
OLIVER Tool and Cutter, Latest Type
PRATT & WHITNEY Contour Cutter—latest type
SELLERS #4T Uni., Tool—latest type

GRINDERS—Surface

ARTER 30" Rotary Surface—Hydraulic—latest type
ARTER 8" Automatic Piston Ring
BLANCHARD #16A—Dial Type—motor drive
BLANCHARD #11, 16" Chuck, Latest Type
BLANCHARD #27-18, M.D., Latest Type
HEALD #22, 12" Rotary, Latest Type
MATTISON 12x16x48 Hyd., Latest Type
MATTISON 14x16x36 Hyd., Latest Type
MATTISON 14x16x60 Hyd., Latest Type
NORTON 10x36 Hyd., Latest Type

JIG BORER

PRATT & WHITNEY 3B, M.D., Latest Type
PRATT & WHITNEY 2A, M.D., Latest Type

LATHES—Engine & Mfg.

AMERICAN 36x25' centers—Timken Bearing—2 carriages P.R.T. Taper Attachment—Latest Type
BETTS BRIDGEFORD 84x24' bed, AC, M.D.
BRIDGEFORD 36"x28', 36"x32' bed—2 carriages, M.D.
HARDINGE TR59, Motor Drive., Latest Type
HARDINGE 9x54" bed, QCG, Cataract
HENDEY 12x54" Centers, Engine, Latest Type
HENDEY 22x8' bed, Engine, Geared Head
HENDEY 14x8' bed, Engine, Geared Head
HOUSTON, STANWOOD & GAMBLE 36x24' bed
KEIGHLEY LIFTS 8x16x4', Gap, AC, M.D.
LeBLOND 13"x4' bed, Timken Mfg.—latest
LOSWING 4x60, 4x84, 8x60, 8x84, 8x108, Timken Bearing, Latest Type
LOSWING 5x34" Model LR Auto. Timken latest
MOREY MATTHEWS, Shaft Turning, Latest Type
NILES 36x24' Centers, Time-Saver, Timken, PRT, Latest Type
NILES 42"x60", double head, Motor Drive
NILES 48x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x10' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x15' centers—heavy duty—Timken Bearing P.R.T.—Latest Type
NILES 60x40' Centers, heavy duty, Timken Bearing, PRT, Latest Type
PITTSBURGH 50"x30' bed—M.D.
REED PRENTICE 20x54" Centers, Timken, Latest
REED PRENTICE 24x20' bed, AC, M.D.
RIVETT #918, M.D. Latest Type
RIVETT #608-4-NS. 8x18 centers, M.D.
WARD HAGGAS & SMITH 18x30x10' bed, Gap Lathe, AC, M.D.

LATHES—Turret

BARDONS & OLIVER #5, #7 Timken Bearing—latest type
CINCINNATI ACME #1, #5W, Timken bearing, latest type
GISHOLT #3, #4, #5 Univ., Timken Bearing, Latest Type
GISHOLT #3D Simplimatics—Timken—latest
GISHOLT #2L, Universal, Timken Bearing, Latest Type
GISHOLT #4L, 9" hole—cross sliding turret—Timken Bearing latest type
JONES & LAMSON #3, #7C Univ., latest type—Timken Bearing
LIBBY #1H-5 Timken Bearing—latest 5½" hole
MOREY 2G, #3, #4, Timken Bearing, latest
WARNER & SWASEY #4A—uni. 8" hole, timken bearing, Latest Type
WARNER & SWASEY #2, #3, #4, Univ., Timken Bearing, Latest Type

MILLING MACHINES—Mfg.

BRIGGS Type 2A, production, HYD., latest type
BROWN & SHARPE #000—Timken Bearing, Latest Type
BROWN & SHARPE #12 auto., Timken—latest
CINCINNATI 56/90 Hydromatic Latest
CINCINNATI #0-8 Vert.—Pl. Auto.—Timken Bearing—latest type—Rise & Fall
CINCINNATI 48" duplex, automatic, SPD
CINCINNATI 24" Duplex, Automatic, M.D.
CINCINNATI 24" Plain, Automatic, M.D.
CINCINNATI 4-36 Hydromatic, Latest Type
INGERSOLL 48x42x16', 4 heads, Planer Type, AC, M.D.
INGERSOLL 32x24x16', 2 heads, Planer Type, AC, M.D.
KEARNEY & TRECKER #1218 Auto.—Timken Bearing—latest type
MOREY #12M 2 spdle. Profiler & Milling Machine
NICHOLS Hand, M.D.—Latest Type
OHIO Auto. 16"x72" table—Timken Bearing
SUNDSTRAND #3 Rigidmill, AC, M.D.
TAYLOR & FENN M-80, Duplex Spline, Latest Type

MILLING MACHINES—Plain

CINCINNATI #3 High Speed, Dial Type, Timken Bearing, latest type
CINCINNATI #4 Timken Bearing, M.D.
CINCINNATI #4S, #5, high power, M.D.
KEARNEY & TRECKER 2H, Timken, Latest
KEARNEY & TRECKER #3K—Timken—latest
KEARNEY & TRECKER 2HL Timken, Latest
KEMPSMITH #4 Maximiller—Timken—latest

MILLING MACHINES—Univ.

AMES Bench, Timken Bearing, latest type, M.D.
BROWN & SHARPE #3A, AC, M.D.
CINCINNATI #2 Dial Type, medium Speed, Timken Latest
HARDINGE Bench, Timken Bearing, Latest Type
VAN NORMAN 22L, Timken Bearing, Latest Type
VAN NORMAN #12, Timken Bearing, Latest

MILLING MACHINES—Vertical

BROWN & SHARPE #5—motor drive
CINCINNATI #2, Dial Type, Highspeed, Timken, Latest
CINCINNATI #3, #4 High-powered, Motor Drive
CINCINNATI #4, High Speed, Dial Type, Timken, Latest
KEARNEY & TRECKER 2K, 3H, 3K, Timken—latest
REED PRENTICE 3VG High-Speed. Latest Type

PLANERS

CHANDLER 36x36x20' 4 heads AC, M.D.
DETRICK & HARVEY 48x48x16', 4 heads, Hyd.
CLEVELAND 48x48x16' Openside, 3 heads, DC, M.D.
GRAY 36x36x16', 3 heads, DC, M.D.
NILES 48x48x16', 2 heads, AC, M.D.
OHIO 42x42x20'—2 heads, AC
POND 48x48x16' 2 heads, AC, M.D.

SAWS

BRIDGEPORT #48W Abrasive
ESPEN LUCAS #138—Cold Saw, M.D.
GROB OS-20—hand and filing—Latest Type
NEWTON #504, cap. 12½" Rd., M.D.
NEWTON #506, cap. 16¾" Rd., M.D.
NEWTON #508, cap. 22" Rd., M.D.

SHAPERS

CINCINNATI 24" Crank—Motor drive
CINCINNATI 26" Travel Head—2 head Type B
COCHRANE BLY Univ. Vert. Shaper-Miller, M.D.
LAMAIRE 18' Vert. Hydraulic—latest type
LYND FARQUHAR 20" Openside, Motor Drive
NILES 18" ver. slotter, DC, M.D.
MOREY 8", 10", 12", 14", Vertical Latest type
NEWTON 15" ver. slotter, D, M.D.
ORMEROD 8" Vertical, M.D.
PRATT & WHITNEY 6', 10" Vertical, Motor Drive

THREAD MILLING MACHINES

HALL—Planetary, M.D.—Latest Type
HANSON & WHITNEY 4x8, Latest Type
MOREY SHIELDS 12x120, 12x192—latest type
PRATT & WHITNEY 4½x12, Model "C"—Latest
PRATT & WHITNEY 6x14, Motor Drive
PRATT & WHITNEY 6x132—Motor Drive
PRATT & WHITNEY 6x20 Model "C"—Latest
SMALLEY General #20 MB, Motor Drive

WOODWORKING MACHINES

YATES AMERICAN J-70, Latest
WYSONG & MILES #283-B Boring Machine, Latest Type
COVEL HANCHETT Model GK-32 Knife Grinder, Latest Type
DURRA JAMES 12" Tilting Arbor Saw Table

MISCELLANEOUS

BARNES #420 2-spindle deep hole Drill—Hyd.—Latest Type
BAUSH Radial Tapper—latest
CASCADE #120 Industrial deep freeze
FERRACUTE No. DG55, Drawing, latest type
GENERAL ELECTRIC 100 KW Generator
LaPOINTE #3L Broach, horiz. hyd. 15 ton cap.
LeBLOND #2 deep hole borer, latest type
MORTON 60" combination travelling head planer, milling and drilling, motor drive.
NILES 30"x50' deep hole borer, Timken—latest
ROWBOTTOM Model 325 Cam Milling Machine, Latest Type
SHUSTER #1 Wire Straightener
TREADWELL 12"—Pipe Threader—Motor Drive
WHITON 8x108 centers duplex centering, M.D.
YODER Multiple tube cutting machine—latest

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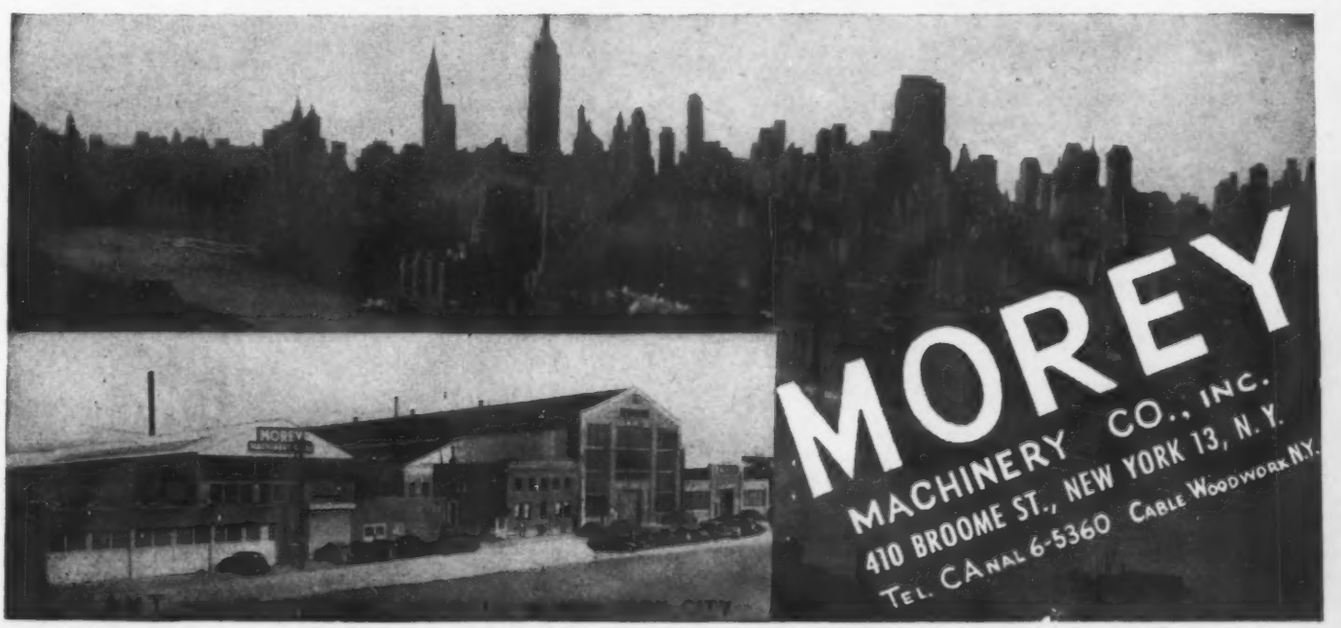

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54"x18' HOUSTON STANWOOD & GAMBLE

Swing over ways—54"
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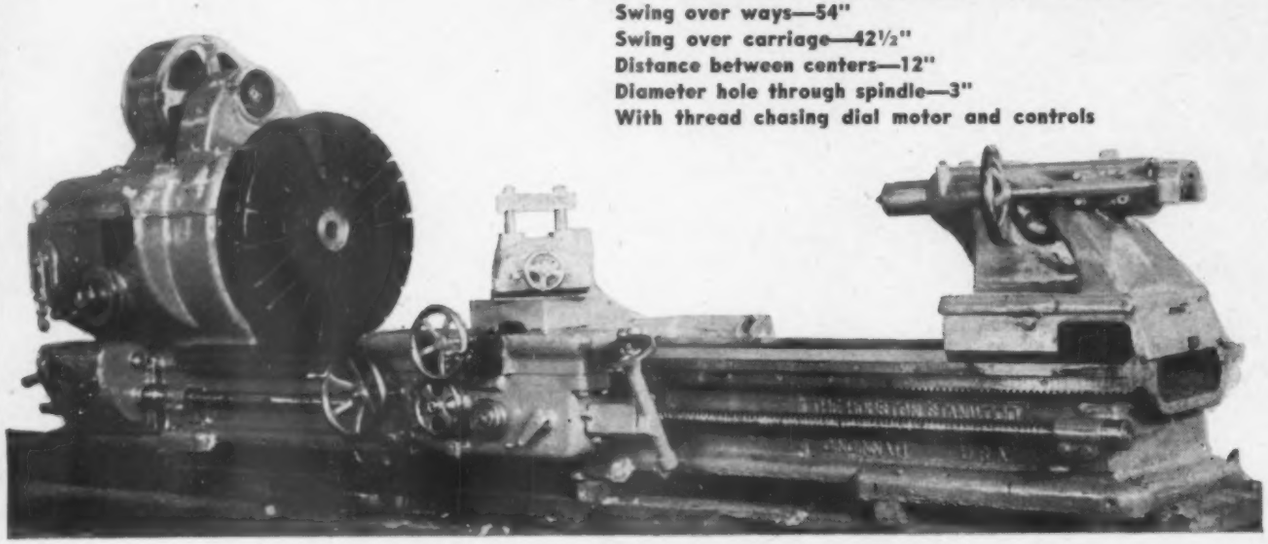
Distance between centers—12"
Diameter hole through spindle—3"
With thread chasing dial motor and controls



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MILLING MACHINES

1—2-H Kearney & Trecker Universal Milling Machine, new 1942.

1—2-MH Cincinnati Plain Milling Machine, new in 1942.

7—2-K Kearney & Trecker Vertical Milling Machines, new in 1942.

2—No. 2 Cincinnati "Dial Type" Medium Speed Vertical Milling Machines, new ..1942.

2—No. 3 Cincinnati "Dial Type" High Speed Vertical Milling Machines, new 1942.

1—No. 0-8 Cincinnati Vertical Milling Machine, new 1942.

1—No. 0-8 Cincinnati Plain, Rise and Fall Horizontal Milling Machine, new 1942.

1—6"x36" Lees Bradner Thread Milling Machine, new in 1942.

SHAPER

1—25" Smith & Mills High Speed Shaper, with swivel vise, new in 1943.

TURRET LATHES

No. 3 Warner & Swasey Universal turret lathes, new in 1942.

No. 4 Warner & Swasey Universal turret lathes, new in 1942.

No. 5 Warner & Swasey Universal turret lathes, new in 1942.

No. 4 Gisholt Universal turret lathe.

GRINDERS

14"x72" Landis Universal Grinder, new in 1940.

6"x18" Cincinnati Plain Cylindrical Grinder, new in 1943.

72A-5 Heald Internal Grinder, new in 1945.

2—No. 70-A Heald Internal Grinders, new in 1941.

No. 2 Cincinnati Centerless Grinder, new in 1942.

No. 3 Cincinnati Centerless Grinder, new in in 1945 (this machine was used 2 months).

GEAR MACHINERY

2—No. 72 Fellows Gear Shapers, new in 1944.

No. 615-A Fellows Gear Shaper, new in 1942.

No. 3 Newark Universal Gear Hobber, for Spur and Spiral Gears, and Worm Wheels up to 18" capacity, new in 1942.

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BOLT CUTTERS, No. 22 Murchey, Dble. Hd.
BOR. MILLS, 2½" bar, Cleveland, M.D.
BORING MILLS, 3" bar Universal.
BORING MILL, Hor. 3½" Landis, Floor Type.
BORING MILL, 36" Bullard, "New Era".
BORING MILL, 60" N-B-P, 2 heads, M.D.
BORING MILL, 40" King, 2 heads, M.D.
BROACH, Hr. Hyd. XA Oilgear, 60" stroke.
BROACH, Vert. Hyd. SRV5-42" LaPointe.
DRILL, Hvy. Duty, No. 513 Baker, No. 6 M.T.
DRILL, Radial 6' Cinc.-Bickford, M.D.
GEAR SHAPER, #75 Fellows, M.D.
GRINDER, Internal, No. 72A5 Heald, 2 Mtr.
GRINDER, Plain, 14"x72" Norton
GRINDER, Plain, 24"x240" Norton, M.D.
GRINDER, Surface, No. 5 Abrasive, 14"x48".
GRINDER, Surf. Hyd. G & L, 14"x18"x72"
GRINDER, Surface, No. 25 Heald Rotary
HAMMER, Board Drop, 1,000#, B. & S.
HOISTS, Monorail, 3 ton, Detroit, D.C.
LATHE, 12"x6' Sebastian, Mtr. in base.
LATHE, 24"x16' B & E Grd. Hd.
LATHE, 27"x18' Niles "Timesaver," Grd. Hd.
LATHE, 36"x22' N-B-P, Grd. Hd., Q.C.G.
LATHE, 38"x19' Putnam, Grd. Hd. Q.C.G., T.A.
LATHE, 42"x50' Putnam, Grd. Hd.
MILLER, Duplex 24" Cincinnati, Auto.
MILLER, Plain, No. 3B Milwaukee, S.P.D.
MILLER, Plain, Nos. 3S, 4 & 5 Cincinnati.
MULT-AU-MATICS, Bullard, Type A, 6-Spdle., m.d.
PLANER, Openside, 30"x30"x12' Cleveland
SHAPER, 32" Gould & Eberhardt, M.D.

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Belt Cutter, 1"-1¼"-2"-2¼"-4" Acme, Landis.
Boring Mills, 24"-36"-42"-52"-72"-96".
Drills, Radial 6' Cin.-Bick. 5' Carlton.
Lathe, Turret 3-A W. & S., S. P. D.
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Millers, Vertical No. 3 B & S & No. 4 Cin.
Profiler, #13 P. & W., B.D.
Shapers, 16"-26"-24"-30".
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1—No. OG B & S High Speed Automatic, ¾" cap. with slotter, swing stop, 220/60/3 motor in base.

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RADIAL DRILLS

3'-11" American Triple Purpose, m.d. on arm
3' American Sensitive, belt
3' Fosdick, gear box
3' Fosdick Sensitive, s.p.d.
3½' Cincinnati-Bickford, gear box
4'-11" American Triple Purpose, gear box m.d.
4'-13" Cincinnati-Bickford, gear box on base
4' Niles-Bement-Pond Semi-Universal, m.d.
5' American Triple Geared, gear box
5' Cincinnati-Bickford Plate Hole Driller, m.d. on arm
5' Prentice, m.d.
6' American Triple Purpose, m.d. on base, 15" col.
6'-15" Carlton, gear box m.d.
6' extended to 7' Cincinnati-Bickford, m.d. on base
6'-15" Cincinnati-Bickford Super-Service, m.d. on arm
6'-15" Niles-Bement-Pond Semi-Universal, m.d.
6'-16" Western, m.d.
8'-16" American Triple Purpose, m.d. on arm
10'-22" American Triple Purpose, m.d. on arm

UPRIGHT DRILLS

24" Cincinnati-Bickford, m.d.
21" Cincinnati-Bickford Super-Service, m.d.
21" Fosdick, m.d.
28" Cincinnati-Bickford, gear box
30" Rich H.D., m.d.
32" Aurora, belt
H3 Barnes Hydram, m.d.
D4 Colburn H.D., m.d.
D8 Colburn H.D., s.p.d.
No. 25 Foote-Burt H.D., s.p.d.
No. 36HO Baker H.D., m.d., with 40" Circular table

GEAR GRINDERS

9" Pratt & Whitney Hydraulic Spur, m.d.
10" Pratt & Whitney Hydraulic, for spur and helical, m.d.
No. 2HS Lees-Bradner Spur & Helical, m.d., latest

GEAR CUTTING MACHINES

No. 3—26" Brown & Sharpe Gear Cutter, m.d.
No. 6—60" Brown & Sharpe, m.d.
3" Gleason Straight Bevel, m.d.
8" Gleason Mfg. Type, m.d.
11" Gleason Straight Bevel, m.d.
12" Gleason Straight Bevel, m.d.
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Gleason Spiral Bevel Gear Rougher, s.p.d.
Cross Gear Tooth Rounder, m.d.
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Type A Barber-Colman Gear Hobber, m.d.
No. 3 Barber-Colman Gear Hobber, m.d., latest
No. 3 Precision Barber-Colman Gear Hobber, m.d., latest
No. 12 Barber-Colman Double Overarm, m.d., long bed type
Barber-Colman Model T Gear Hobber, m.d., latest
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48" Cleveland Gear Hobber, m.d.
No. 61A, 615A, 645A3 Fellows Gear Shapers, m.d., latest type
No. 7A, 71A Fellows Gear Shapers, m.d.
No. 6, 61 Fellows, belt
No. 13LS Fellows Gear Lapper, m.d.
No. 18 Fellows Gear Finishing Machine, m.d.
No. 64-S Fellows Gear Shaper, m.d.

CENTERLESS GRINDERS

No. 2 Cincinnati, m.d., new, latest type
No. 3 Cincinnati, m.d., new, latest type
No. 2 Cincinnati, m.d., latest type
No. 2 Cincinnati, m.d., older type
Cincinnati Valve Seat Grinder, cap. 3/8" valve stems

CYLINDER GRINDERS

No. 73 Heald Airplane Cylinder, m.d., new, latest type
No. 50 Heald Hydraulic, m.d., new, latest type
No. 55 Heald, m.d.
No. 65 Heald
No. 6 Landis, belt

UNIVERSAL CYLINDRICAL GRINDERS

12x24" Cincinnati Self-Contained, m.d., latest mechanical type
12x30" Brown & Sharpe, belt
12x30" Landis Hydraulic, m.d. latest
12x36" Cincinnati Self-Contained, m.d.
12x36" Cincinnati, belt
12x48" Norton Hydraulic, m.d., latest

PLAIN CYLINDRICAL GRINDERS

3x18" No. 5 Brown & Sharpe, m.d., latest
6x18" Cincinnati Hydraulic, m.d.
6x18" Landis, m.d.
No. 10 Brown & Sharpe, m.d.
No. 11 Brown & Sharpe, m.d.
6x32" Fitchburg Type A, m.d., latest
6x30" Cincinnati Hydraulic, m.d.
8x36" Cincinnati Saddle Type, m.d.
10x24" Landis Self-Contained, m.d.
10x36" Cincinnati Hydraulic, m.d.
10x48" Brown & Sharpe, belt
10x48" Landis Type C Hydraulic, m.d., latest
10x72" No. 16 Brown & Sharpe, belt
10x72" Landis Self-Contained, m.d.
12x36" Landis, m.d.
12x48" Cincinnati Self-Contained, m.d.
12x48" Modern, belted m.d.
12x96" Landis Self-Contained, m.d.
14x18" Cincinnati Self-Contained, m.d.
14x48" Cincinnati Self-Contained, m.d.
14x52" Norton, motorized
14x72" Cincinnati Self-Contained, m.d.
16x72" Landis Self-Contained, m.d.
20x120" Landis Self-Contained, with gap, m.d.
26x96" Landis Self-Contained, m.d.

INTERNAL GRINDERS

No. 72A3, 72A5 Heald Plain, m.d.
No. 6, 10, 20 Bryant, belt
No. 16A—16", 16—22", 16RS Bryant Hydraulic, m.d., latest
No. 24—21" Bryant Hydraulic, m.d.
No. 49 Heald Single End Borematic, m.d.
No. 72A3 Heald Sizematic, m.d.
No. 72A3 Heald Gagematic, m.d.
No. 72A5 Heald, m.d., latest type
No. 73 Heald Airplane, new latest
No. 74 Heald, m.d.
No. 172 Heald Gap, m.d., new, latest

DISC GRINDERS

No. 4 Gardner, m.d.
No. 20 Gardner Comb. Disc Grinder and Roll Sander, m.d.
7½ H.P. United States, 2 tables, new
7½ H.P. Standard, 2 tables, new

THREAD GRINDER

No. 33 Excello Precision Thread, m.d., latest

SURFACE GRINDERS

No. 3 Abrasive, m.d. in base
No. 2 Brown & Sharpe, belt
14" Pratt & Whitney Vertical, m.d.
22" Pratt & Whitney Type B, m.d.
Builders Iron Foundry Co. Surface, m.d.
No. 10 Blanchard, m.d. on spindle, 16" chuck
No. 11 Blanchard, m.d., latest
No. 16 Blanchard, m.d., 26" chuck
No. 18 Blanchard, m.d., 30" chuck, latest
No. 33 Abrasive Vertical, m.d.
Arter 16" Model A3 Rotary, m.d., new
No. 25A—16" Heald Rotary, m.d., latest
No. 25A—24" Heald Rotary, m.d., latest
No. 22—12" Heald Rotary, m.d.
No. 260—16" Heald Rotary, m.d.
30"x18"x6' Springfield Planer Type, m.d.
54" Bridgeport Knife, belt
No. 76D Baldwin-Tuthill Knife, m.d.

TOOL & CUTTER GRINDERS

No. 13 Brown & Sharpe Universal & Tool, m.d.
Cincinnati Monoset Tool, m.d.
Gisholt Universal, belt
Gould & Eberhardt Gear Cutter, belt
No. 3 Gallmeyer & Livingston, m.d.
No. 6G Sellers Drill, m.d.
No. 2 Ohio Universal, belt

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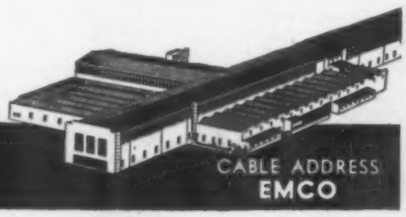

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★ 9/16" RA-6 Acme-Gridley Automatic Screw Machines. Bar equipment. New in 1943.
2⅝" RA-6 Acme-Gridley, New in 1943.
1¼"—8 spindle Cone. New in 1942.
5/16" Cleveland Model A, single spindle.
16" x 33" Fay Automatic Lathe.
⅞" Cleveland Model M, four spindle.

BORING MILLS

No. 31 Lucas Horizontal, m.d.

BROACHES

LaPointe CPC 24, Hyd., Vertical. New in 1945.
★ H-15-60 American Horizontal Hydraulic Broaching Machine, 15 ton capacity, 60" stroke, with 20 HP motor and control. New in 1942.

DRILLS

4' Canedy-Otto Radial Drill. New in 1946.
No. D2 Colburn, single spindle.
No. 314 Baker, single spindle.
42" Cincinnati-Bickford.
★ No. 2LMS Leland Gifford Single spindle drill, with hand-hydraulic spindle feed, motor driven. New in 1943.
★ No. 3 Baush Multiple Drill, 20 spindle, No. 2 Morse taper, rectangular head 20" x 40".

GEAR CUTTERS

No. 3 and No. 12 Barber-Colman Gear Hobbers.
No. 61 Fellows Gear Shaper, m.d.
No. 7125 and No. 715 Fellows Gear Shaper, m.d.
6" Gleason Str. Bevel Gear Generator.

GRINDERS

No. 22 Heald Rotary Surface Grinder.
No. 16-26" Blanchard Surface Grinder.
No. 72A3 Heald Sizematic Intern. Grndr.
No. 72A3 Heald Gagematic Intern. Grndr.
6 x18 Cincinnati Cylindrical. New in 1943.
10 x 36 Norton Cylindrical. New in 1942.
No. 13 Brown & Sharpe Universal & Tool.
★ No. 2 and No. 3 Cincinnati Centerless Grinders, with Filmatic Spindle, some with through feed rest, others with in-feed; motor driven. New in 1940 and 1941.
★ Model B Thompson Hydraulic Surface Grinder, 10" x 24" capacity. New in 1942.
No. 35 Excello Thread Grinder. New '43.
No. 5-VRO Hammond Buffer. New 1943.

LATHES, ENGINE

12" x 30" Pratt & Whitney, g.h.
14" x 6' Sebastian, motor in base.
16" x 6' Hendey, g.h.
18" x 12' Lodge & Shipley, g.h.

No. 3616 Cleveland Rigidhobber, for spur or spiral gears, capacity 1½ D.P. in steel, maximum diameter 42", face width 16", motor driven. New in 1943.
No. 3 Brown & Sharpe Universal Grinder, capacity 14" swing x 40" center to center, with internal grinding fixture chuck, steady rests, coolant equipment, motors and controls. New in 1943.

24" x 12' Monarch helical, g.h.
25" x 12' LeBlond, g.h. New in 1941.
IMP and LR LO-Swing Lathe, m.d.
48" x 12' Lodge & Shipley, c.d.
15" x 30" Lipe Carbo-matic. New in 1943.
17" x 50" LeBlonde Production, m.d. New in 1942.

LATHES, TURRET

No. 4A Warner & Swasey, g.h. New '42.
No. 3A Warner & Swasey, g.h.
No. 1A Warner & Swasey, g.h. New '43.
No. 4 Gisholt, Univrsl., g.h. New in 1943.
No. 3 Warner & Swasey, g.h. New 1943.
No. 1 Bardons & Oliver, c.d.
No. 1 Brown & Sharpe, m.d.
No. 6D Potter & Johnston.
36", 42" Bullard VTL, New Era.

MILLS

No. 3 Cincinnati Universal, motor in base, rectangular overarm.
No. 4 K & T Milwaukee Plain. New in 1942.
No. 4B Brown & Sharpe Plain, m.d.
No. 2H Milwaukee Plain double overarm, motor in base.
No. 2 MH Cincinnati Plain, m.d.
No. 2 H Milwaukee Vert., motor in base.
No. 2HL Milwaukee Plain, new in 1942.
No. 2 Cincinnati Vertical, motor in base, new in 1943.
No. 2209 Milwaukee Mill, table 22"x158".
No. 3-36"Cinci. Hydromatic Duplex, m.d.
No. 56-72" Cinci. Hyd. Duplex Milling Machine.
No. 6 Whitney Hand Mill.
★ 28 x 60 Cincinnati Vertical Hydro-Tel Milling Machine, single spindle with profile tracing attachment, m.d. New in 1942.

PLANERS AND SHAPERS

16" Gould & Eberhardt Crank Shaper.
20" American Crank Shaper, m.d.
★ 6" Pratt & Whitney Vertical Shaper.
No. 14 Cochrane & Bly Vertical Shaper.
36" x 36" x 12' Liberty Planer, 2 heads, box table.
42" x 42" x 20' Cincinnati Planer, D.C. Rev. M.D.

TAPPERS

No. 2X Garvin Tapper, m.d.
No. 2BG Garvin.
Leland-Gifford Radial.

MISCELLANEOUS

No. 17 Greenerd Arbor Press.

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Drills, 21" Royersford Bk Grd. Pr. Feed, New
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Drill, #25 Foot-Burt motor driven
Drills—New—18" Royal Motor driven (10)
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Gear Cutter, Gould & Eberhardt 42"
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22" Buffalo Pr. Fd. Motor Drive, New
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Magic Chucks #1-2 & 3 and Collets
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Turret Lathe, 2" Acme & Warner & Swasey
Welders—Arc & Spot in Stock—New

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⅞" & 1¼" Cone 4 spindle
1 1/16" Cleveland 4 spindle
2"x18" Cleveland Model B
12"x63" & 14"x19" Fay
14"x18" Monarch Magna-Matic
No. 454 New Britain chucking
Gisholt simplimatic

BORING MILLS

3½" bar Universal horizontal
3⅛" bar Giddings & Lewis horiz.
4¾" bar, No. 300 Giddings & Lewis floor type
100" Niles Bement Pond heavy pattern
96" Cincinnati Masive Pattern
60" Colburn
53" Niles Bement Pond
24", 36" & 42" Bullard
10D Moline cylinder borer

BROACHES

No. 25 LaPointe
Twin 10 Oilgear duplex
VI Foote Burt duplex surface
3XA Oilgear
HP50 Lapointe
XB12 Oilgear duplex
No. 3 LaPointe double screw
12 ton V50 American vertical
30 ton V48 American vertical

DRILLS

4'-9" Cincinnati Bickford radial
21" & 24" Cincinnati upright
Nos. 121 & 315 Baker
24" No. 3 Allen 3 spdl., P.F.
21"x74" Munson double end
No. 005 Garvin double end
21" & 24" Cincinnati upright
24" No. 25 Foote Burt Heavy Duty
34-spdl. #30 Natco

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Nos. 8H, 12H & 16HS Gould & Eberhardt
Nos. 3 & 12 Barber Colman
Mod. T Barber Colman taper spline
No. 130 Cleveland Rigidhobber
Nos. 1, 5A & 5AC Lees Bradner

LATHES, TURRET

Nos. 4 & 5 Warner & Swasey universal
Nos. 3-B & 5 Foster universal
Nos. 3 & 5 J. & L. universal
16"x6' South Bend
Nos. 3 & 5 Foster
24" & 42" Bullard vertical
28" Gisholt
3"x36" & 4"x34" Jones & Lamson
Nos. 3, 4 & 5 Gisholt univ.

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150 ton, No. 661 Toledo coining
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1" National
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MISCELLANEOUS

#10-D Moline Cylinder borer
#112-C Ex-Cell-O precision borer
Nos. 2 & 3 Cincinnati centerless grinders
No. H-1 Micromatic Hydrohoner
#211 Barnes honer
No. 9 LeBlond Multicut lathe
6", 8" and 15" Sundstrand automatic slub lathes
#12-B Pratt & Whitney profiler
Model J Radiac abrasive saw
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9" Bar BETTS Horizontal floor type, 50" face plate
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24" New Era, BULLARD
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12' BETTS Extra Heavy double drive
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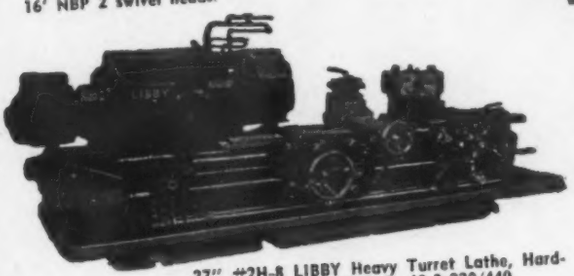
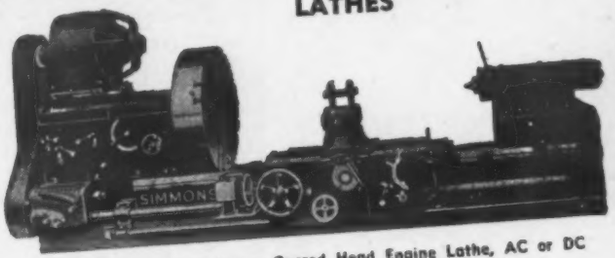
16' NBP 2 swivel heads.



27" #2H-8 LIBBY Heavy Turret Lathe, Hardened Steel Ways 20 H.P. 60-3-220/440

LATHES



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24"x13' AMERICAN 12-Speed G.H.
25"x10' LEBLOND G.H.
27"x22' REED PRENTICE G.H.
30"x18' AMERICAN 12 Speed, G.H.
30"x23' AMERICAN 12-speed, G.H.
36"x40' AMERICAN 16-speed geared head.
42"x34' LEBLOND late type, 27-speed, G.H.
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48"x45' NILES, 16-speed, G.H.
60"x27' NILES, 24-speed, G.H.
90" PUTNAM Driving Wheel Lathe with journal truing.
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#3HS Cincinnati Dial Type Plain Miller
#1248 Milwaukee Simplex Miller
#3—36" Cincinnati Hydromatic Plain Miller
#2—18" Cincinnati Plain Miller
#1—18" Cincinnati Plain Miller
#2-L Lapointe Hydraulic Horizontal Broach
#4 Warner & Swasey Universal Turret Lathe
#3 Warner & Swasey Universal Turret Lathe
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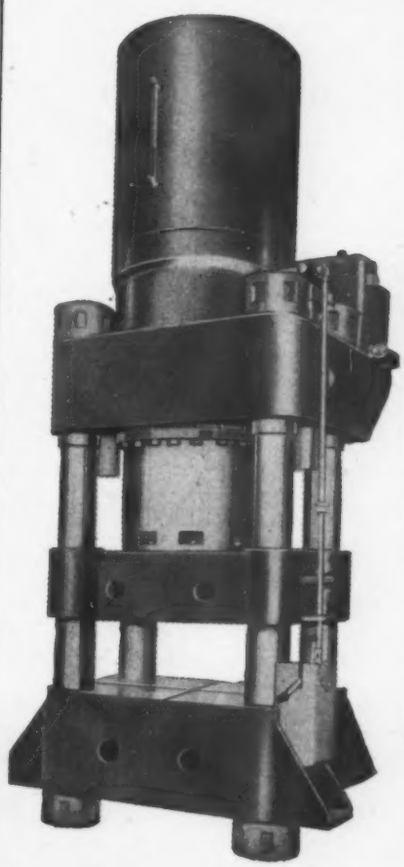

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#O Giddings & Lewis arr., M.D.
2½", Cleveland Spd.
2½", 4" Binsee
66" Niles
54" Colburn, M.D. 2 hds.

TURRET LATHES

W & S No. 3 Grd. Hd., Univ., M.D., Late 4, 5.
Gisholt No. 1L, 2L Univ. M.D.
Foster Nos. 4, 5, 6, 1B, 3B M.D. Univ.
J. & L. 2½"x24", 3¼"x36", #3.
Acme #2 M.D.

GRINDERS

#25 Gallmeyer & Livingston, M.D.
#25A Heald, M.D.
No. 2 Cincinnati Centerless M.D.
B. & S. No. 2, 2B Surface, M.D.
P. & W. 14", B.B., Vert. M.D.
Blanchard 30", M.D.; Modern 12x48" M.D.
Norton Hydraulic 12x18", M.D.
Heald Nos. 72A3 Gagematic
Norton 50"x28', M.D.
Landis Type A 6x20" Hydraulic, M.D.
Bryant No. 12, M.D.
No. 55, 60, 65 Heald int., M.D.
12" Heald Rotary Arter 12" M.D.
B. & S. No. 10 1 Cyl. #5,
B. & S. No. 1, 3 Universal
Grenby 1-2 Int.
Norton 6x18" Hyd. Surface, M.D.

LATHES

10"x3', 9"x4' South Bend, M. D. Late.
Monarch, Hendey 12x30 geared head, Late
26x12' Boye & Emmes 3 step cone B.D.G.
14"x6' Hendey
9" LeBlond Automatic
36x30' Putnam M.D.
36x22" Putnam, D.C. M.D.
32"x35' Wickes, M.D.
Putnam 42x16', M.D. S.C.G.
P. & W. 1x18, Automatic Lathes

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Cleveland Model A ⅞", 1¼", 2"
Cleveland Model B 1", 2"
P & J 6A, M.D.
⅞" Cone 4 spindle, Gridley
B & S #0

New in Stock—Power Shears 52" and 72"

Spot & Arc Welders
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H.S. Vertical Milling Heads
Drill Presses, Foot Presses
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8" Shape-Rite Shapers
No. 1½ Abrasive Surface Grinder
6x6" Racine Hacksaw
20 ton Northern Hydraulic Presses

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4' Fosdick arranged for motor drive
4', 5', 6' American Triple Purpose
4', 6' Cincinnati-Bickford
4' Muller, M.D.; 4' 5' Western, S.P.D.
9J Gorton Vert., M.D.

MILLING MACHINES

Bridgeport Vert., M.D.
No. 1 Cleveland Vert.
#12, #22L Van Norman Univ.
#2B K & T Univ.
#2HL Milwaukee, M.D.
No. 3S Cincinnati, S.P.D. rapid trav.
Nos. 0Y, 3, 4, 5 B & S Plain & Univ.
B. & S. Nos. 12, 13B
Hall Planetary Model D Thread Miller
Becker Nos. 3, AB, 5, 6, Vert.
Nos. 2, 3, 4, Cincinnati Vert.
P. & W. No. 12, 30" Profiler M.D.
K. & T. B. & S., No. 2, 3
B. & S. No. 1, 3, Vert.
B & S #12 Elec. Prod. late type

MISCELLANEOUS

Buffalo #0 Angle Roll, M.D.
#20, 21 Bliss OBI Power Presses
Gorton No. 1S Engraving Machine 3Z, 3U
6 spindle Avey Drill 15" overhang
Rochester No. 5½" B Hammer
6" Vertical Shaper P & W
Oster Pipe Machines, 4", 6"
N.B.P. 15" Slotter M.D.
10x10 Peerless Universal Shaping Saw
#7, 72 Fellows Gear Shapers
Lennox Throttless shear ¼" cap., M.D.
Decke Engraving Mchs., G1, G2

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1—Cin. No. 3S Univ. Miller, rect. overarm, tbl. wkg. surf. 55¾"x13½", range: long. 34", cross 12", vert. 20".

1—Van Norman No. 2 Duplex Miller, tbl. wkg. surf. 41⅞"x9¾", power long. feed 28", cross 11", vert. 18".

1—Van Norman No. 3 Duplex Miller, high speed mill. attmt., 12 speeds, tbl. wkg. surf. 48¼"x10", power feed: long. 32", cross 12", vert. 18⅞".

1—B. & S. No. 2 light type, Pl. Hor. Miller, very latest type, tbl. wkg. surf. 45"x10", all power feeds: long. 28", cross 10", vert. 15".

Brand new—1—Gomco 20" Univ. Shaper, power down feed.

Pratt & Whitney 6" Vert. Shaper (Very Latest Type)

1—Bridgeford 36"x56', 15 speed, grd. hed., Eng. Lathe, M.D. AC elect. equip. power rap. trav. to carr., compound rest. 2 steady rests. sw. 38" over bed, 26" over carr., dist. betw. cens. 48'.

1—LeBlond 21"x10' Heavy Duty Eng. Lathe, M.D., sw. over bed 21¼" dist. betw. cens. 153", mtzd.—Good Condition.

Hendey 14"x6' grd. hed. and 14"x6' Yoke Hed. Tool Room Lathe, with Taper attmts.

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3'9" Cin.-Bickford, Mtr. on arm—1942 Mfg.
3'9" Avey Sensitive Radial
16" Sipp—4 spindle—T&L Dr.
16" Allen—4 spindle—T&L Dr.
Natco D5 Multiple—Mtr. Dr.
16" Can.-Otto Floor & Bench—110/1/60—NEW
21" Can.-Otto—BG—Upr—Sl. Head—NEW

GRINDERS

Reid #2C Hand Feed Surface—1942 Mfg.
6x18 Monarch Surface—Hand—Mtr. Spdle.
14x14x48 Abrasive Surface—Mtr. Dr.
#2 Cincinnati Centerless—Filmatic—1942 Mfg.
#25 Heald Rotary Surface—M.D.

LATHES

16/20x58" Lodge & Shipley—Sel. Head—Mtr. Dr.—1942 Mfg.
16"x6' Sebastian 8-speed—Mtr. Dr.—NEW
16"x6' Lodge & Shipley—4-speed—Mtr. Dr.—QCG
36"x15' American QCG—Felt Dr.
10"x24" Logan Bench and Floor—NEW
#2 Warner & Swasey—4 Sp. Drive—M.D.

MILLING MACHINES

Van Norman #22L with extras
#2M Cinc. Plain Horiz.—Mtr. Dr.—Vert. Attach.
#2S Van Norman—Plain Horiz.—PRT—1942 Mfg.
2A B & S Double Overarm—Universal—Mtr. Dr. —Vert. Attach.—all geared
#2G Kempsmith Universal—Div. Hds.—1943 Mfg.
#2MH Cinc.—Plain Horiz.—PRT—1942 Mfg.
#3 Garvin Universal—Mtr. Dr.—Vert. Attach.—Div. Hds.
#3 Cinc.—Plain Horiz.—PRT—1942 Mfg.
#3 Ohio Universal—Belt Drive
#2K K & T Vertical—PRT—1942 Mfg.
#5 Cinc. Vertical—PRT—1942 Mfg.
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Close for press earlier than the usual weekly closing time.

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39/64"	1.25 "
⅝"	1.75 "
41/64	1.75 "
21/32"	1.75 "
43/64"	1.75 "
11/16"	1.75 "
45/64"	1.75 "
23/32"	1.75 "
47/64"	1.75 "
¾"	2.00 "
49/64"	2.00 "
25/32"	2.00 "
51/64"	2.00 "
13/16"	2.00 "
53/64"	2.00 "
27/32"	2.00 "
55/64"	2.00 "
⅞"	2.50 "
57/64"	2.50 "
29/32"	2.50 "
59/64"	2.50 "
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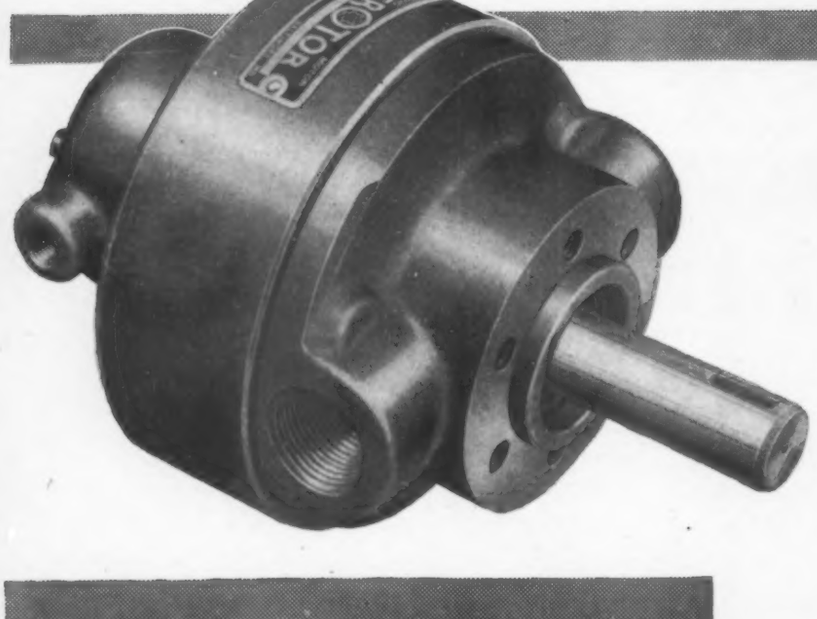

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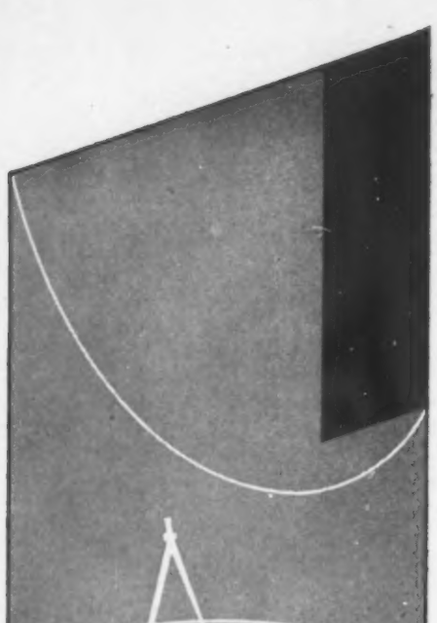

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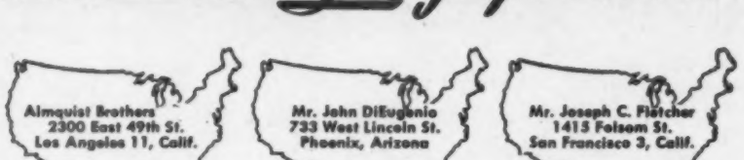

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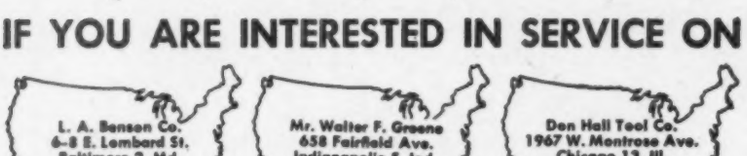

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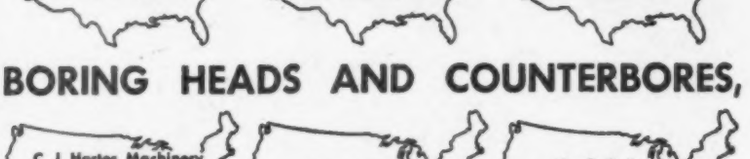

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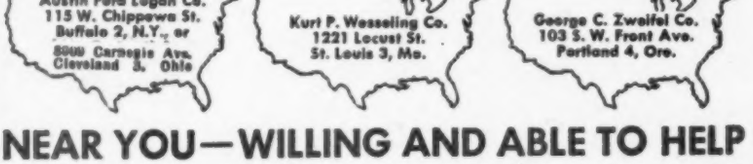

WITH PRODUCTION PROBLEMS

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SPRINGFIELD, VERMONT, U. S. A.

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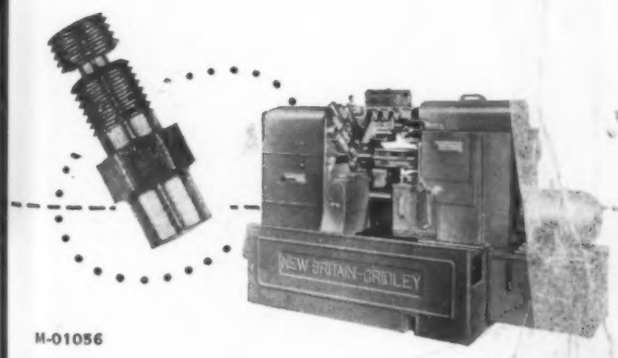

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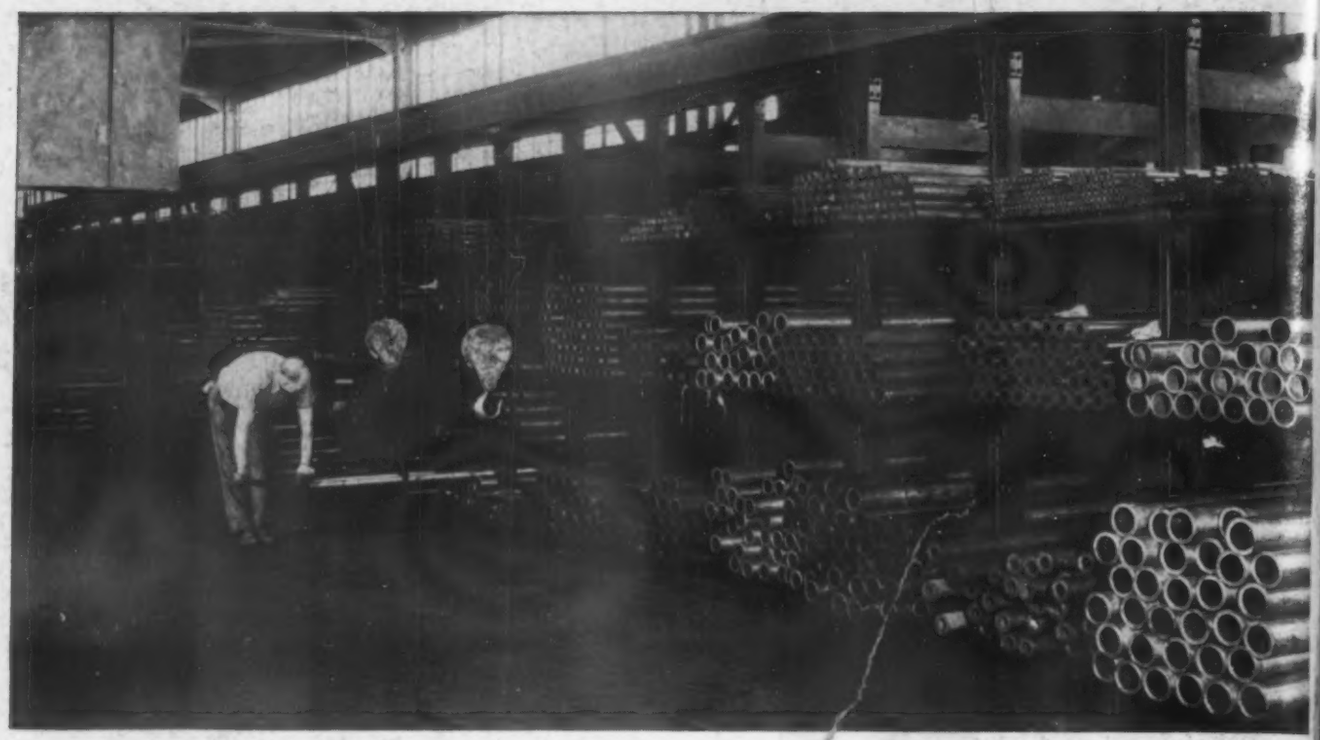

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